Water Survival Manual

SEAFARERS HARRY LUNDEBERG SCHOOL OF SEAMANSHIP
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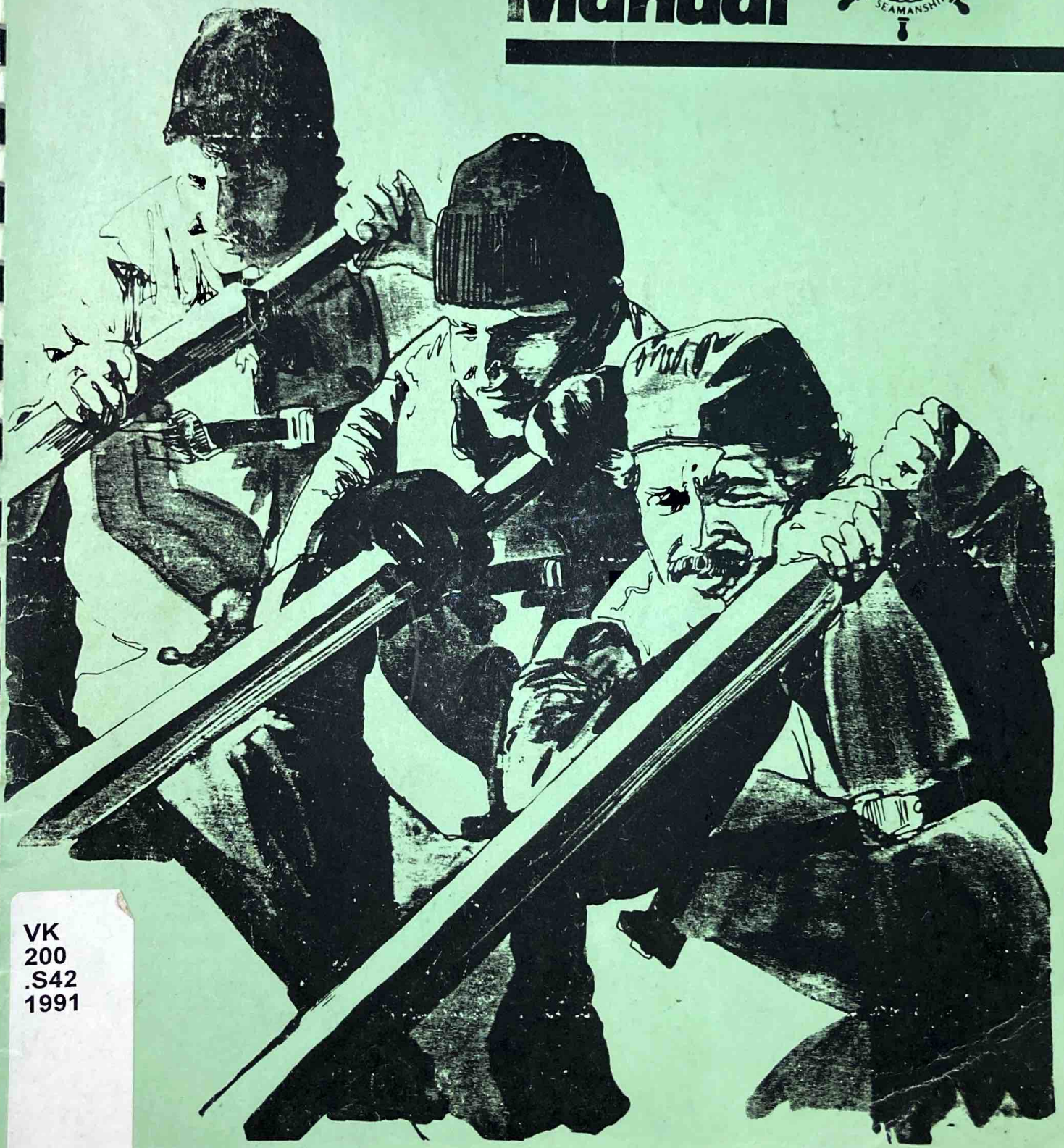

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Water Survival Manual

Seafarers Harry Lundeberg School of Seamanship

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Chapter 1
PLANNING AHEAD

A. Be Prepared For Emergencies

Fear of the unknown reduces your ability to think and plan. If you know what to do in case of disaster, no emergency situation will be completely strange or frightening to you. You will be capable of surviving without your ship until help arrives.

The time to prepare for an emergency is *before* it happens. When you first report aboard your ship, you should immediately:

1. Find the station bill and learn your emergency duties.
2. Take a tour of all areas right away.
3. Trace out all of the passageways and know where they lead.
4. Find all of the exits.
5. Think of yourself trapped in any part of the ship, in the dark, with one exit blocked by fire or flooding. Plan your escape routes.
6. Find your lifejacket.
7. Review the emergency signals.
8. Find your lifeboat station.
9. Find all liferafts.
10. Find all fire stations.
11. Know where all the fire alarm controls are. There should be several of them in key locations.

Be enthusiastic and interested during the **weekly fire and boat drills.** They can provide valuable training. Report any equipment that does not work properly to your supervisor. Ask questions about any part of the drill that you do not understand.

DO NOT PANIC! Keep calm. Practice your training. THINK! Panic only makes the initial danger worse. You must react in a predictable way. When an emergency happens and you can't think straight, STOP, remember your drills. Remember what you were taught. Think positively. Ask yourself, "What can I do to survive and help others to survive?"

Your ship may sink slowly. You may have enough time to collect additional items to help you stay alive. In cold weather, take additional blankets. Bring extra water if time permits.

B. Have Proper Clothing Ready at All Times

Gather the items that you will need to dress for cold water survival. You will need to follow the steps below. Put the items described in a special place in your room ready for immediate use in a crisis.

For abandonment into cold water, you should:

1. Rub fat or grease all over your naked body. It provides insulation from the cold.
2. Put on underwear.
3. Wear a wool shirt.
4. Put on "long johns" over your legs.
5. Wear soft woolen socks.
6. Wear nylon socks over the woolen socks.
7. Put on a woolen sweater.
8. Wear a denim jean jacket over the sweater.
9. Wear a turtleneck sweater over the jacket.
10. Put on pants.
11. Put on coveralls with a long scarf to seal in the neck opening.
12. Put on a heavy coat with hood drawn tight. If you do not have a hood, be sure to wear a hat.
13. Cover all this with oil skin rain gear. Seal the pants and arm cuffs with heavy rubberbands. Put on water proof boots.
14. Wear diver's goggles.
15. Put on your life jacket.

-OR-

Wear a Coast Guard approved survival suit and fewer clothes.

DEPARTMENT OF TRANSPORTATION
U.S. COAST GUARD
CG 848 (Rev. 7-77)

UNITED STATES COAST GUARD
SPECIMEN OF A STANDARD STATION BILL PREPARED FOR FREIGHT AND TANK SHIPS CARRYING PERSONS IN ADDITION TO CREW

STATION BILL

(Name of Ship) (Name of Company)

SIGNALS

FIRE AND EMERGENCY - Continuous sounding of general alarm bells and on the whistle for a period of at least 10 seconds.
ABANDON SHIP - More than 6 short blasts and 1 long blast on the whistle and the same signal on the general alarm bells.
MAN OVERBOARD - Hail, and pass the word "MAN OVERBOARD" to the bridge.
DISMISSAL - From FIRE AND EMERGENCY stations, 3 short blasts on the whistle and 3 short rings on the general alarm bells.

WHERE WHISTLE SIGNALS ARE USED FOR HANDLING BOATS
Lower boats—1 short blast on whistle
Stop lowering boats—2 short blasts on whistle
Dismissal from boat stations—3 short blasts on whistle

INSTRUCTIONS

1. Entire crew shall familiarize themselves with the location and duties of their emergency stations immediately upon reporting on board.
2. Each crew member shall be provided with an individual supplementary station bill card which must show in detail the special duties to perform.
3. Entire crew shall be instructed in the performance of their special duties and crew on watch will remain on watch on signal for emergency drill.
4. Every person participating in the abandon-ship drill will be required to wear a life preserver and entire boat crew shall assist in removing covers and swinging out boats.
5. Emergency Squad will assemble with equipment at scene of action immediately upon the emergency signal.
6. Stewards' department will assemble and direct passengers, properly dressed and wearing life preservers, to embarkation stations.
7. Person discovering FIRE shall immediately notify the bridge and fight the fire with available equipment.
8. Immediately upon the FIRE AND EMERGENCY signal, fire pumps to be started, all watertight doors, ports, and air shafts to be closed, and all fans and blowers stopped. Fire hose to be led out in the affected area as directed.
9. Upon hearing the signal, "MAN OVERBOARD," throw life ring buoys overboard, stop engines and send lookout aloft. Emergency boat crew consisting of all seamen shall immediately clear lee boat for launching.
10. During periods of low visibility, all watertight doors and ports below the bulkhead deck shall by closed, subject to the Master's orders.

No.	RATING	FIRE AND EMERGENCY STATIONS	No.		ABANDON SHIP—BOAT STATIONS
		DECK DEPARTMENT			
A.	Master	On the bridge. In command, all operations.	A.	Lifeboat No. 1	In command. On bridge in charge all operations.
1	Chief Mate	At scene of emergency. In charge.	1.	Lifeboat No. 2	In command. In charge launching lifeboats amidship.
2	2d Mate	On the bridge. Relieve the watch.	2	Lifeboat No. 3	In command. On the bridge. Relieve the watch.
3	3d Mate	Prepare all lifeboats for launching. In charge.	3	Lifeboat No. 4	In command. In charge launching lifeboats aft.
4	Radio Operator	Radio room. At instruments.	4	Lifeboat No. 1	Attend Master's orders and instructions.
5	Boatswain	Emergency squad. Provide life lines.	5	Lifeboat No. 1	2d in command. Attend forward gripes and falls.
6	Able Seaman	Emergency squad. Relieve the wheel.	6	Lifeboat No. 2	2d in command. Attend forward gripes and falls.
7	Able Seaman	Emergency squad. Provide extra length of hose and spanner	7	Lifeboat No. 3	2d in command. Attend forward gripes and falls.
8	Able Seaman	Emergency squad. Provide fire extinguisher	8	Lifeboat No. 4	2d in command. Attend forward gripes and falls.
9	Able Seaman	Emergency squad. Provide fire ax.	9	Lifeboat No. 1	Release boat chocks and secure drain cap.
10	Able Seaman	Emergency squad. Provide fresh air mask.	10	Lifeboat No. 2	Release boat chocks and secure drain cap.
11	Able Seaman	Assist 3d Mate prepare lifeboats for launching.	11	Lifeboat No. 3	Release boat chocks and secure drain cap.
12	Able Seaman	Assist 3d Mate prepare lifeboats for launching.	12	Lifeboat No. 1	Lead out and attend boat painter.
13	Able Seaman	Emergency squad. Assist with fresh air mask.	13	Lifeboat No. 2	Lead out and attend boat painter.
14	Able Seaman	Assist 3d Mate prepare lifeboats for launching.	14	Lifeboat No. 3	Lead out and attend boat painter.
15	Ordinary Seaman	Bridge. Act as messenger	15	Lifeboat No. 4	Release boat chocks and secure drain cap.
16	Ordinary Seaman	Emergency squad. Act as messenger	16	Lifeboat No. 1	Lead out and attend boat painter.
17	Ordinary Seaman	Assist 3d Mate prepare lifeboats for launching.	17	Lifeboat No. 2	Lead out and attend boat painter.
		ENGINE DEPARTMENT			
18	Chief Engineer	In charge of Engine Department.	18	Lifeboat No. 1	Assist in general operations.
19	1st Assistant	Engine room. In charge.	19	Lifeboat No. 2	Assist in general operations.
20	2d Assistant	In charge of fire room and steam smothering apparatus.	20	Lifeboat No. 3	Assist in general operations.
21	3d Assistant	Attend main steam smothering line.	21	Lifeboat No. 4	Assist in general operations.
22	Jr. Engineer	Attend CO_2 or foam smothering system.	22	Lifeboat No. 1	Turn out forward davit and assist at forward falls.
23	Jr. Engineer	Attend CO_2 or foam smothering system.	23	Lifeboat No. 2	Turn out forward davit and assist at forward falls.
24	Jr. Engineer	Engine room. At fire pumps.	24	Lifeboat No. 3	Turn out forward davit and assist at forward falls.
25	Pumpman	Assist 2d Assistant Engineer in fire room.	25	Lifeboat No. 1	Release after gripes and attend after falls.
26	2d Pumpman	Emergency squad. Assist with fresh air mask.	26	Lifeboat No. 4	Lead out and attend boat painter.
27	Electrician	Engine room. At main panel.	27	Lifeboat No. 4	Assist in general operations.
28	Machinist	Engine room. Assist at fire pumps.	28	Lifeboat No. 4	Turn out forward davit and assist at forward falls.
29	Oiler	Engine room. Assist at fire pumps.	29	Lifeboat No. 2	Release after gripes and attend after falls.
30	Oiler	Engine room. Trim ventilators as directed.	30	Lifeboat No. 3	Release after gripes and attend after falls.
31	Oiler	Engine room. Trim ventilators as directed.	31	Lifeboat No. 4	Release after gripes and attend after falls.
32	Oiler	Assist at steam smothering manifold.	32	Lifeboat No. 1	Turn out after davit and assist at after falls.
33	Oiler	Assist at CO^2 or foam smothering system.	33	Lifeboat No. 2	Turn out after davit and assist at after falls.
34	Oiler	Engine room. At portable fire extinguisher	34	Lifeboat No. 3	Turn out after davit and assist at after falls.
35	Watertender	Fire room. Assist 2d Assistant Engineer	35	Lifeboat No. 4	Turn out after davit and assist at after falls.
36	Watertender	Emergency squad. Provide wrenches and pliers.	36	Lifeboat No. 1	Assist release gripes and turn out davits.
37	Watertender	Engine room. Assist at fire pumps.	37	Lifeboat No. 2	Assist release gripes and turn out davits.
38	Fireman	Fire room. Assist 2d Assistant Engineer	38	Lifeboat No. 1	Turn out forward davit.
39	Fireman	Fire room. Assist 2d Assistant Engineer	39	Lifeboat No. 2	Turn out forward davit.
40	Fireman	Fire room. Assist 2d Assistant Engineer	40	Lifeboat No. 3	Turn out forward davit.
41	Fireman	Fire room. Assist 2d Assistant Engineer	41	Lifeboat No. 3	Assist release gripes and turn out davits.
42	Fireman	Fire room. Assist 2d Assistant Engineer	42	Lifeboat No. 4	Assist release gripes and turn out davits.
43	Fireman	Fire room. Assist 2d Assistant Engineer	43	Lifeboat No. 3	Turn out davits and assist at falls.
44	Storekeeper	Emergency squad. Provide inhalator	44	Lifeboat No. 2	Turn out davits and assist at falls.
45	Wiper	Engine room. Act as messenger	45	Lifeboat No. 1	Turn out after davit.
46	Wiper	Assist 3d Officer prepare lifeboats for launching.	46	Lifeboat No. 1	Stand by life ring buoy, ready for use.
47	Wiper	Emergency squad. Assist with fresh air mask.	47	Lifeboat No. 2	Stand by life ring buoy, ready for use.
48	Wiper	Emergency squad. Assist with inhalator	48	Lifeboat No. 1	Turn out davits and assist at falls.
		STEWARDS' DEPARTMENT			
49	Chief Steward	Arouse, warn, and direct passengers. In charge.	49	Lifeboat No. 1	Arouse, warn, and direct passengers. In charge.
50	Chief Cook	Secure galley.	50	Lifeboat No. 3	Lead out and attend boat painter.
51	2d Cook	Assist Chief Cook secure galley.	51	Lifeboat No. 4	Lead out and attend boat painter.
52	Messman	Close all ports and doors amidships.	52	Lifeboat No. 4	Turn out forward davit.
53	Messman	Close all ports and doors starboard side aft.	53	Lifeboat No. 2	Turn out after davit.
54	Messman	Close all ports and doors port side aft.	54	Lifeboat No. 3	Turn out after davit.
55	Messman	Arouse, warn, and direct passengers.	55	Lifeboat No. 2	Arouse, warn, and direct passengers.
56	Utilityman	Secure mess rooms aft.	56	Lifeboat No. 4	Turn out after davit.
57	Utilityman	Assist 3d Mate prepare lifeboats for launching.	57	Lifeboat No. 3	Stand by life ring buoy, ready for use.
58	Galleyman	Assist 3d Mate prepare lifeboats for launching.	58	Lifeboat No. 4	Stand by life ring buoy, ready for use.

Station Bill
Figure 1-1

Department of
Transportation
U.S. Coast Guard
CG 848 (Rev. 7-67)

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9. Upon hearing the signal, "MAN OVERBOARD," throw life ring buoys overboard, stop engines and send lookout aloft. Emergency boat crew consisting of all seamen shall immediately clear lee boat for launching.
10. During periods of low visability, all watertight doors and ports below the bulkhead deck shall by closed, subject to the Master's orders.

Station Bill
Figure 1-2

C. Find Your Shipboard Emergency Duties

Station Bill

There is a **station bill** on every American merchant ship and offshore mobile rig. It is posted where all crew members can easily find it. The station bill lists:

1. **Alarm signals**
2. **Instructions**
3. **Emergency duties**

You should locate the station bill and learn your duties.

Figures 1-1 and 1-2 are samples of a station bill.

Supplementary Station Bill Card

Your individual emergency duties are also on a small card called the **supplementary station bill card.** It will be posted near your bunk, or it may be given to you when you board the ship. (See figure 1-3.)

SS OCEANIC

Name: AB#10 8 to 12 WATCH

Article No. 10 Rating: AB

Emergency Station: PROVIDE FRESH AIR MASK

PORT Boat No.: 2

Boat Station: RELEASE BOAT CHOCKS AND SECURE DRAIN CAP

Figure 1-3

Muster List

The **lifeboatman in charge, the coxswain** of each lifeboat will be given a **muster list** which gives the (1) rating and (2) abandon ship duties of each member of his boat crew. These duties will be the same as the duties on the station bill and supplementary station bill cards.

D. Know These Signals and Alarms

It is very important that you know the emergency alarm signals and the lifeboat drill signals. These signals are on the station bill. Below is a complete list of the alarm and boat drill signals.

Alarm Signals

1. **Fire and Emergency** — Continuous sounding of general alarm bells and whistle for at least 10 seconds.
2. **Abandon Ship** — More than six short blasts and one long blast on the whistle and general alarm bells.
3. **Man Overboard** — Hail and pass the words "Man Overboard" to the bridge.
4. **Dismissal** from fire and emergency — three short blasts on the whistle and three short rings on the general alarm bells.

Lifeboat drill signals

Lower boats — one short blast on the whistle.

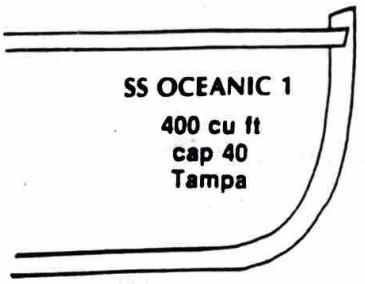
2. **Stop Lowering boats** — two short blasts on the whistle.
3. **Raise boats** — a verbal (spoken) command given by the coxswain to "raise the boat."
4. **Dismissal** from boat stations — three short blasts on the whistle.

Chapter 2
USING LIFEBOATS

A. Markings

Lifeboats are marked as follows:

1. On **each side of the bow** (See Figure 2-1.)
   a. In at least **3 inch high letters.**
      (1) The **vessel's name.**
      (2) The lifeboat's **numer.**
   b. In at least **1½ inch high letters.**
      (1) The **capacity** in cubic feet.
      (2) The **number of persons** allowed in the boat.
      (3) The vessel's **port of registry.**



Bow Markings
Figure 2-1

2. The **number of persons** allowed in the lifeboat must also be marked in **3 inch high letters** on at least **two of the thwarts.**
3. The **vessel's name** must also be clearly printed on:
   a. Each and every one of the **oars.**.
   b. Each and every one of the life preservers **(PFD s).**
   c. Each and every one of the Emergency Position Indicating Beacons **(EPIRBs).**
4. On one side of the lifeboat's bow there must be attached a **builder's plate** (See Figure 2-2.) which tells:
   a. The **manufacture's name.**
   b. The **capacity** in cubic feet.
   c. The **number of persons** allowed in the lifeboat.

Builder's Plate
Figure 2-2

B. Coloring

The tops of the thwarts, the sidebenches, and the footings of open lifeboats are painted **international orange.** The canopy exteriors of enclosed lifeboats are also painted **international orange.** Sails and canvas canopies must be dyed **Indian orange.**

There is a twelve-inch wide **white** stripe from the keel to the sidebench as background for the **red Rottmer releasing lever** in its middle. The white makes it easier for you to see the red releasing lever.

C. Numbering

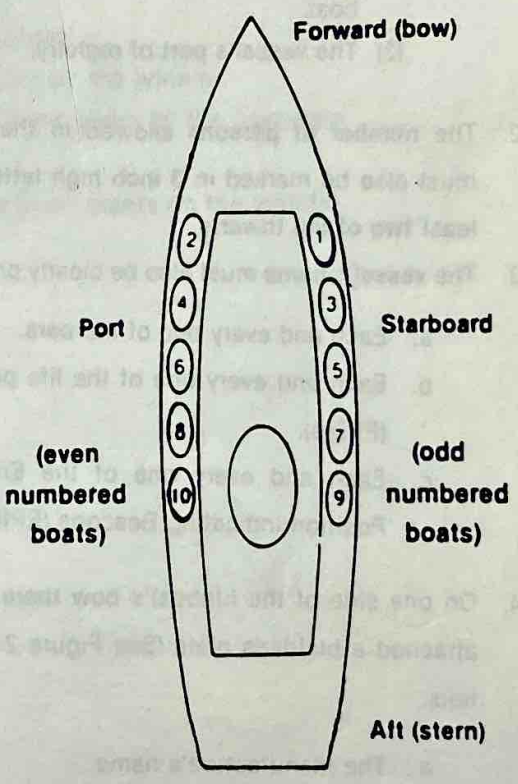
Each lifeboat is given a number which must be marked on each side of the bow in 3 **inch high letters.**

Odd numbered boats are on the **starboard side** of the ship.

Even numbered boats are on the **port side** of the ship.

In Figure 2-3, notice that lifeboat number 2 is forward of lifeboat number 4 on the port side and lifeboat number 7 is abaft (behind or aft) of lifeboat number 5 on the starboard side.

Larger, older ships may have two lifeboats stowed (kept) in the same davit. These are called **nested boats.** The lifeboat under number 1 is numbered 1-A. The lifeboat under number 2 is numbered 2-A, etc.



Overhead View of Passenger Ship with 10 Lifeboats
Figure 2-3

D. Construction

Lifeboats (or acceptable substitutes) are considered to be the **primary lifesaving equipment** aboard ships. They differ in their construction, but certain features and parts are the same on all lifeboats. You should know the names of, and the purposes for, the parts of lifeboats.

Lifeboats are normally **double-ended**, which means that they are pointed at both ends. This design makes them more **seaworthy** (less likely to be swamped or to "broach to").

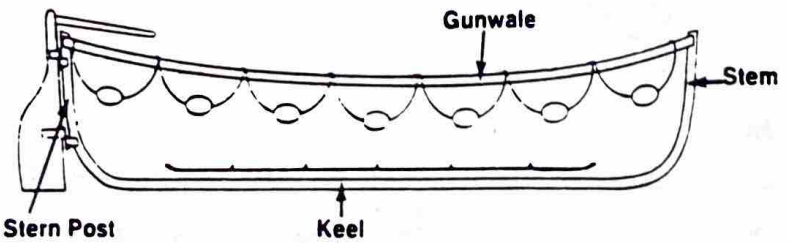
Lifeboats on modern ships are usually made of galvanized steel, aluminum, or fiberglass. An aluminum lifeboat is especially subject to damage by **electrolytic corrosion** (the aluminum being eaten away) if iron or steel tools are left lying in or near the lifeboat.

Only the Coast Guard can approve any changes in the design and/or construction of a lifeboat. In an emergency, changes can be made, but those changes *must* be reported to the Officer in Charge of Marine Inspection (OCMI) in the first port reached after the changes are made.

Each lifeboat must be stripped, cleaned, and thoroughly overhauled at least **once every year.**

E. Lifeboat Shell

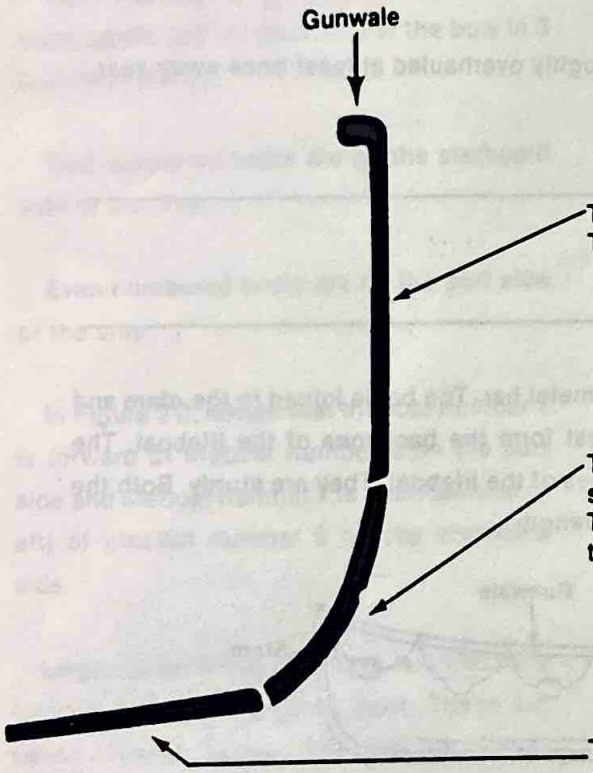
The **keel** on a metal boat is a heavy, rectangular metal bar. The bar is joined to the **stem** and **stern post.** Together, the keel, stem and stern post form the **backbone** of the lifeboat. The **gunwales** run along the top row plating on both sides of the lifeboat. They are sturdy. Both the gunwales and the keel give the boat **lengthwise strength**.



The Lifeboat Shell
Figure 2-4

Plating is the metal siding on the lifeboat. The top row of plating is called the **sheer strake.** The sheer strake is just below the gunwale. The middle row of plating is the **bilge strake.** It is located where the sides turn in toward the bottom of the lifeboat. The **garboard strake** is the bottom row of plating. It is fitted next to the keel.

The lifeboat needs extra plating on the spots which rest on the **cradle.** The cradle is the place where the lifeboat rests when it is in the stowed position. This extra thickness of shell plating is called **doubler plating.** Doubler plating can become worn if the lifeboat rubs the cradle. The doubler plating should be checked each time the boat is lifted or swung out.



The top row of plating is called the **sheer strake.**
The sheer strake is just below the gunwale.

The middle row of plating is called the **bilge strake.**
The bilge strake is where the sides turn in toward the bottom of the lifeboat.

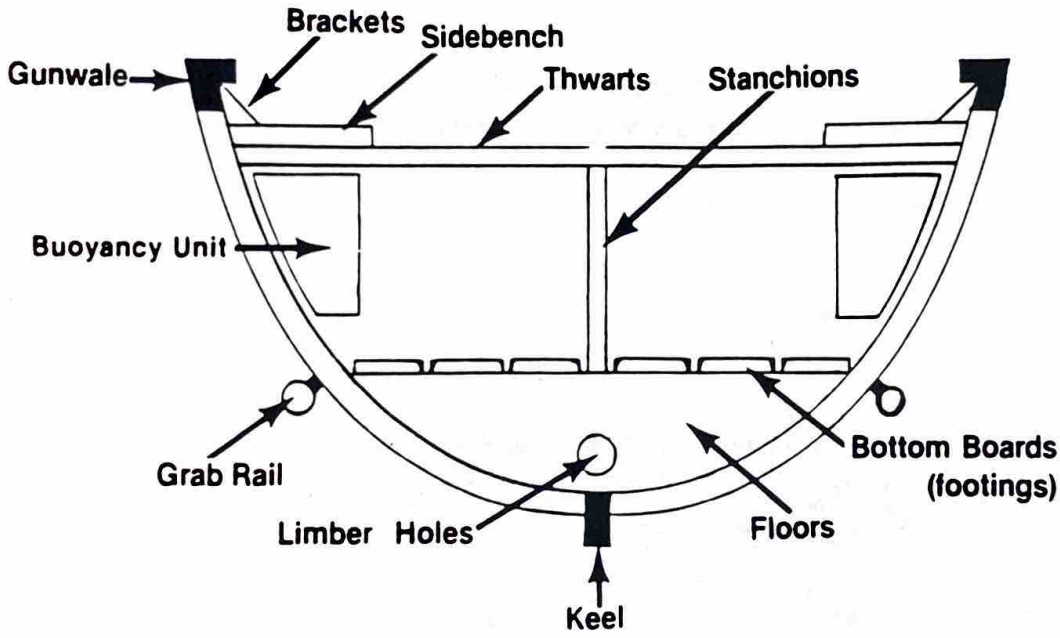
The bottom row of plating is called the **garboard strake.**
The garboard strake is next to the keel.

Lifeboat Cross Section
Figure 2-5

F. Interior Construction

There are four places to sit in a lifeboat: the thwarts, the **sidebenches,** the **bow sheets** and **stem sheets.** (See figure 2-7.)

The **thwarts** extend from side to side **(athwartship)** in a lifeboat. They provide the athwartship strength to the boat as well as a place for the rowers to sit while they are pulling at the oars. Upright **stanchions** beneath each thwart gives additional support to the thwart and strength to the boat. For each thwart, **footrests (stretchers)** are provided for the rowers to brace their feet against while they are rowing. (See figure 2-6.)



Construction, Drainage and Buoyancy Features

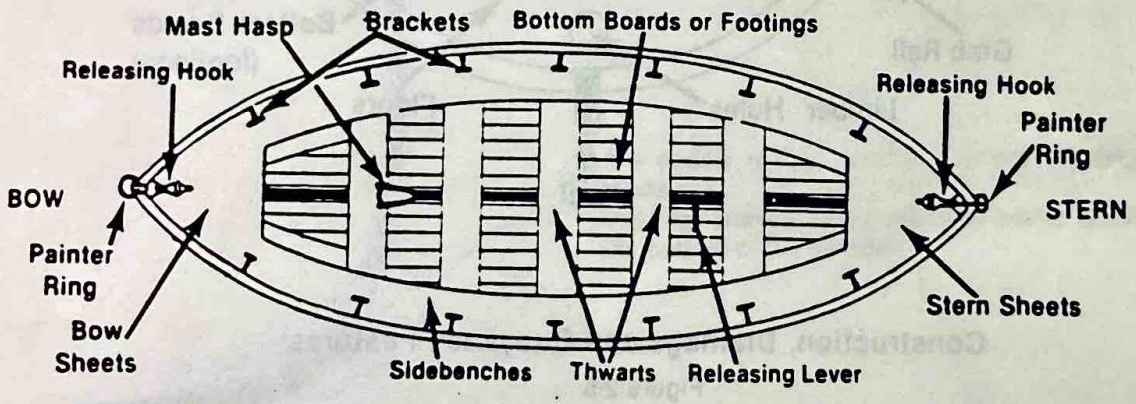
Figure 2-6

Sidebenches on both sides provide more seating in the lifeboat. **Brackets,** metal bars that help support the sidebenches and the thwarts, run from the gunwales to the sidebenches and are bolted through the sidebenches and the ends of the thwarts. (See figure 2-7.)

The **bow sheets** are the seating area furthest forward in the lifeboat. The **stern sheets** are the aftermost (furthest aft) seating area. The coxwain usually stands at the stern sheets when he is steering the lifeboat. (See figure 2-7.)

Bottom boards (footings) are in the inside bottom of the lifeboat. (See figure 2-6 and 2-7.) The bottom boards in turn are attached to and rest upon **floors,** which are metal ribs or bars running athwartship in the bilge of the lifeboat. The bottom boards are wooden and run lengthwise of the boat. The bottom boards spread the weight of persons and equipment over a wide area of the thin shell plating of the hull. They also add to the overall strength of the lifeboat. They may be removed for painting or other maintenance work on the bottom of the boat.

A releasing gear is installed in lifeboats to ensure that both ends of the lifeboat are released from the falls at the same instant. A complete explanation of releasing gear is included in the section on davits later in this manual.



Overhead View of Interior Construction of Lifeboat
Figure 2-7

G. Buoyancy and Stability Features

Under each sidebench are **buoyancy units**, which together provide enough flotation to keep the boat, loaded to capacity with people and equipment, afloat even if it is full of water. Buoyancy units are placed under the sidebenches to make the boat less likely to capsize (turn over). Buoyancy units are usually **air tanks** or units of **unicellular plastic foam.** Buoyancy units are generally constructed so they can be removed for painting and other maintenance. If the units are removed, for any reason, they must be restowed (put back) in their original position.

The older lifeboats will have air tanks used as buoyancy units. A seaman can often tell if a tank is air tight by looking at it on a hot day. If the flat sides of any tank are not bulging, it is probably leaking. To check the tank for leaks, remove the nipple and force air into the tank with a small air pump or by blowing through rubber tubing. The sides of the tank will bulge if the tank is not leaking. If there is a large leak, the air will escape through it. To check for a small leak, replace the cap after you have filled the tank with air.

The pressure will force air out the small leak. You can locate the leak by brushing soapy water over the tank when it is full or holding the tank under water. In either case, bubbles will show you where the leak is. (See Figure 2-8.)

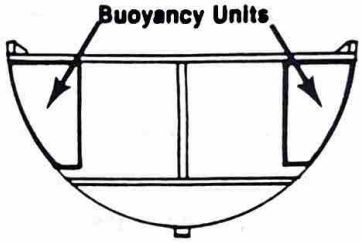
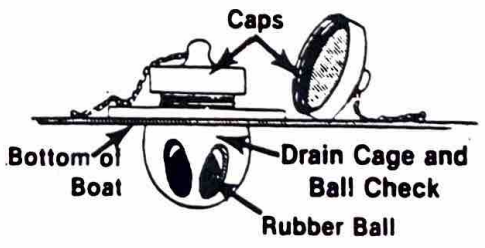


Figure 2-8

H. Drainage

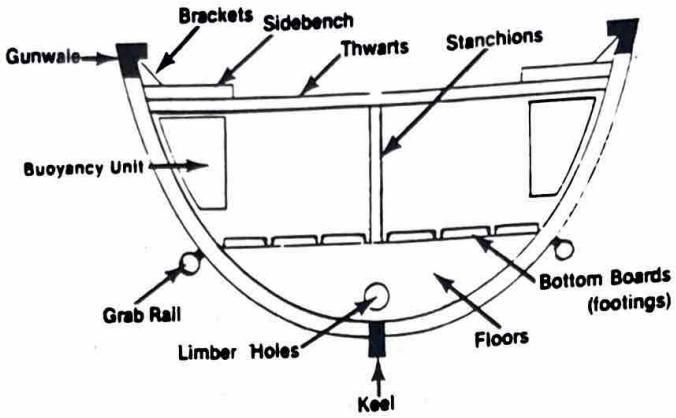
One or more **drains** are provided in each lifeboat to allow water to run out when the boat is lifted out of the water. A small metal cage forms the part of the drain below the bottom of the boat. In the cage, there is a rubber ball which floats up when the boat is in the water. It acts as an **automatic closing valve.** The ball should be kept in good condition and cleaned of fuel oil which could damage it.



Lifeboat Drain
Figure 2-9

Drains should be kept clean at all times. If there is trash or rubbish in the cage, the ball cannot function. A metal cap, secured to each drain by a short length of small chain, is used for closing off the drain. When entering a lifeboat to prepare to launch it, **the first and most important thing to do is to close the drain by screwing on the metal cap.** The boat drain should be open when the boat is in the stowed position. (See Figure 2-9.)

Limber holes are openings in the support frame **(floors)** of a lifeboat. They do not go through the shell to the outside of the boat, but they do allow water in the bilge to flow from one compartment to the next so that it can get to the boat drain and so drain from the lifeboat while it is out of the water or stowed.



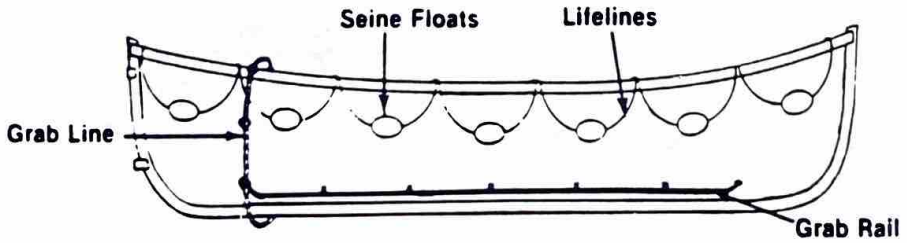
Construction, Drainage and Buoyancy Features
Figure 2-10

I. Exterior Rescue Features

On the outside of the lifeboat, near the turn of the bilges, there are metal bars called **grab rails.** People can hold onto the grab rails if the boat turns over in the water. The grab rails are secured in such a way that the lifeboat will not get holes in the plating if the grab rails are broken off.

Grablines must be rigged if there are no grab rails. Grablines are three knotted lines of 2 inch manila rope. They should be passed from gunwale to gunwale under the keel.

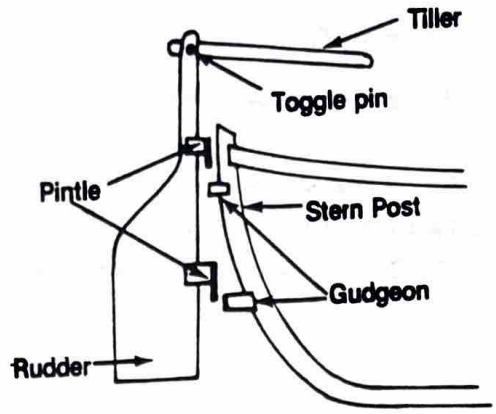
Lifelines must be of size and strength not less than 3/8 inch manila line. They must be divided into bights (loops) of three feet or less. There is a seine float in each bight to hold the lifeline up in the water. Some lifelines are made of buoyant materials, such as synthetic line. They float without the use of seine floats. Lifelines have two purposes. They are something to hang onto for (1) swimmers or (2) people who cannot find space in a crowded boat. (See Figure 2-11.)



Rescue Features of the Lifeboat
Figure 2-11

J. Steering Equipment

An **unbalanced rudder** is provided for steering each lifeboat. You turn the rudder with the **tiller.** The tiller is attached to the top part of the rudder. A **toggle pin** is used to hold the tiller in place. The rudder is held in place by **pintles** and **gudgeons.** The **pintles** (metal pins) are on the rudder. They fit into the **gudgeons** (metal straps) that are on the stern post. Most rudders are made of wood. Sometimes, watertight, hollow metal rudders that will float are used. (See Figure 2-12.)



Steering Equipment

Figure 2-12

Lifeboats are relatively easy to maneuver because the size of the lifeboat rudder is large in proportion to the size of the boat. Remember, when you're steering a lifeboat with the tiller and rudder:

1. When you put the **tiller** to **starboard** (right), the rudder moves to **port** (left), making the boat turn to **port**.

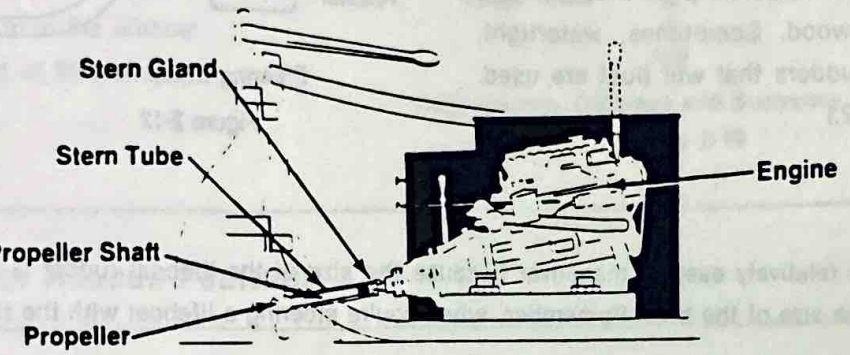
2. When you put the **tiller** to **port**, the **rudder** moves to **starboard,** making the boat turn to **starboard**.

When you're steering in heavy seas, and you want to keep the lifeboat on the correct course, allow the bow to swing back and forth on each side of the desired heading. You will not be able to steer a steady course in rough seas.

K. Propulsion Systems

Engine Powered Systems

Many lifeboats have **diesel engines** in them. The engine is mounted inside the lifeboat. There is an opening in the hull of the lifeboat for the **propeller shaft.** The shaft, where it goes through the hull, is encased (inside) in a hollow pipe called the **stern tube.** There is a ring, called the **stern gland,** that fits inside of the stern tube. The stern gland has packing in it that stops water from entering the boat. (See Figure 2-13.) Engine powered lifeboats have forward, neutral, and reverse.



Propeller System of an Engine-Powered Lifeboat
Figure 2-13

The hull of a lifeboat with a water-cooled engine has two other holes in its outer shell. A cooling water pump on the engine draws seawater in through one of these holes to cool the engine. The water is discharged through the other hole with the exhaust gases. Some lifeboat engines are air-cooled.

A Class 1 motor lifeboat, fitted with a compression ignition engine, is capable of being readily started in all conditions, and has sufficient fuel for **24 hours** continuous operation. The speed ahead in **smooth water** when loaded with its full complement of persons and equipment shall be at least **6 knots**.

Lifeboats designed to carry more than 100 persons shall be motor-propelled, except that a lifeboat designed to carry more than 100 persons may be hand-propelled if it is a replacement for a previously approved hand-propelled lifeboat.

The engine in a lifeboat must be operated each time an abandon ship drill is held. If the boat is not put in the water, the engine should only be run for a limited amount of time because the engine will eventually overheat.

There are several different brands of engines and starting systems. Each may have a slightly different starting procedure. Check the instructions for your own ship's boats soon after you report aboard. General instructions for a **hydraulic cranking system** are listed below.

1. Check the two hydraulic pressure gauges located beneath the hinged cover at the forward end of the engine compartment. If both gauges read 2500-3000 psi and only one valve is open so that the second pressure cylinder is kept in reserve, the engine is ready to start.
2. If no pressure reading is visible on either gauge, open one valve and close the other.
3. Remove the pump handle located in the top starboard side of the engine box.
4. Insert the handle in the hand pump located on starboard forward end of engine.
5. Pump pressure until one gauge reads 2500-3000 psi.
6. Close the open valve and open the valve that was closed.
7. Pump pressure until remaining gauge reads 2500-3000 psi.
8. Open one valve.
9. Push the engine stop control in.
10. Pull the throttle control out fully.
11. Place the gear control lever in neutral position.
12. Push the start valve with your foot. Hold it in until the engine starts. Release the foot valve as soon as the engine starts. The foot valve is mounted on the aft end of the engine box.
13. Push the throttle into idle engine speed.
14. Check the oil pressure gauge. It should read 40-60 psi. If no pressure is shown within 30 seconds, shut down and investigate the cause.
15. Check the exhaust discharge for flow of seawater. If cooling seawater is not being discharged, the engine will eventually overheat. Investigate and correct the cause before the engine overheats.

Propeller Characteristics

When you are handling an engine propelled lifeboat, you should understand the thrust effects of the propeller.

First find out if the propeller turns to the left or right when going ahead. This is necessary because the direction of rotation will determine which way the boat will swing when moving.

To find out if the direction of rotation is right- or left-handed, look at the boat from astern (behind) when it is out of the water. **If the propeller is rotating clockwise with the engine in forward gear, it is right-handed.** If it is rotating counterclockwise, the propeller is left-handed.

The effect of the propeller side thrust is greater when the engine is going astern than when it is going ahead. It is also greater when the boat is dead in the water than when the boat is moving.

With the rudder amidships and no current, the following characteristics may be observed:

1. In a **right-handed propeller:**
   a. going ahead kicks the stern to starboard.
   b. going astern kicks the stern to port.
2. In a **left-handed propeller:**
   a. going ahead kicks the stern to port.
   b. going astern kicks the stern to starboard.

Most lifeboats are equipped with right-handed propellers. Therefore, when backing a lifeboat with the rudder amidships, **the boat will back to port.** So, right rudder must be applied to counteract the propeller side thrust.

Safety Notes on Engine Powered Lifeboats

Avoid injuring people during drills. Keep the deck area around the propeller clear. Keep flames away from fuel or fuel's vapor.

Engine powered lifeboats have a **fire extinguisher** stowed at each end of the boat. These extinguishers may be used to extinguish **class B** (diesel fuel and other flammable liquids) and **class C** (electrical) fires. Most portable extinguishers operate this way:

1. Remove extinguisher from bracket.
2. Hold upright.
3. Pull pin out of handle.
4. Squeeze lever handle.
5. Aim just under the flames.
6. Sweep in side-to side motion the entire width of the fire.

Check the extinguishers in your boat. They may operate differently.

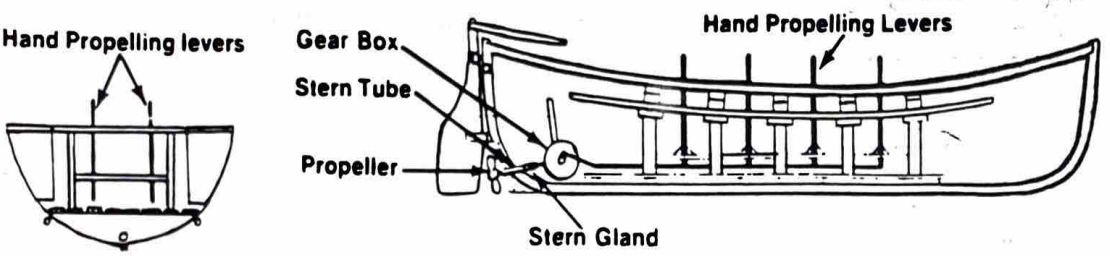
Hand Propelled Systems.

There is hand propelling gear (**Fleming gear**) in some lifeboats. This type of system includes a propeller, stern tube, stern gland, and gears.

The boat is propelled (moved) by pulling lever handles fore (forward) and aft (backward). The

bottom ends of the lever handles fit into sockets. The sockets are connected :o a bar on each side of the boat. These two bars move cranks on the sides of the gear box. The cranks rotate the propeller shaft. The bars, cranks, and levers must always be kept clear of stowed gear so they can operate properly.

The gear box is located near the stern of the boat. It controls the boat's forward and reverse gears. No water should be allowed to collect around the gear box in either an engine or hand propelled lifeboat. In cold weather, the water could freeze and make it impossible for the gears to operate.



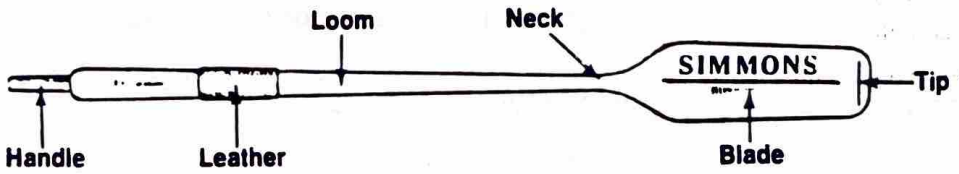
Lifeboat with Hand-Propelling Gear (front and side views)
Figure 2-14

Oar Propelled Lifeboats.

Oar propelled lifeboats are moved by occupants rowing the boat. By regulation, the capacity of an oar propelled lifeboat is limited to a maximum of 59 persons. Lifeboats designed to carry 60 but not more than 100 persons must be either hand propelled (Fleming gear) or motor propelled. Lifeboats designed to carry more than 100 persons must be motor propelled.

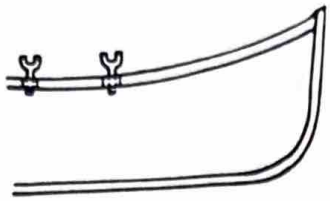
All Lifeboats (even those with motors or Fleming gear systems) must carry at least **four rowing oars** and **one steering oar** (sweep). Covered lifeboats are an exception: they must have four rowing oars, but they are not required to carry a steering oar.

The names for the parts of the oar are shown in Figure 2-15. Notice that the name of the vessel is printed in large letters on the blades of all oars.



Lifeboat Oar
Figure 2-15

There are U-shaped metal fittings along the sides of the lifeboat in the gunwales. These are **rowlocks.** Rowlocks fit into holes (sockets) in the gunwales. The oars are put in the rowlocks when rowing. (See Figure 2-16.)



Rowlocks
Figure 2-16

The oars used for rowing are called **rowing oars.** There is another oar called the **sweep** or **steering oar.** It is longer than the other oars. The sweep oar is used to steer the boat if the rudder becomes damaged or lost. It works better than the rudder when the boat is dead in the water. A special steering rowlock is attached to the gunwale near the stern for use of the sweap.

Commands for Lifeboats Under Oars

Certain commands have been set up to maneuver the lifeboat safely if rowing becomes necessary. These commands are given by the **coxswain.** They are listed below. The **after starboard oarsman** should set the rowing pace.

Command and Crew Response

OARS OUT: Lifelines out, rowlocks in sockets, place oars in rowlocks with blades feathered flat. This gets the oars into the **neutral position, ready for action.**

GIVE WAY TOGETHER: Lean toward the coxswain, arms straight out, blades dipped halfway into the water. Follow the person in front of you, **pull the blade through the water.** Lift blades from the water at the end of the stroke and feather flat. Repeat process. **This moves the boat ahead.**

OARS: Blades are brought temporarily out of the water, blades feathered flat, oar straight out. This places the oars in a **neutral position.**

BACKWATER ALL: Row astern. **This backs the boat up.**

HOLDWATER: Drop blades vertically into the water, straight out. Brace yourself against the oar. **This slows the boat down.**

TRAIL OARS: The blades are positioned close to the side of the boat. Point the blades away from the danger. **This gets the oars out of the way** when the boat passes close to any obstruction which the oars might hit.

BACKWATER PORT, GIVE WAY STARBOARD: Port side backs water, starboard side gives way. **This turns the boat fast to port.**

BACKWATER STARBOARD, GIVE WAY PORT: Starboard side backs water, port side gives way. **This turns the boat fast to starboard.**

WAY ENOUGH: Swing oars into the boat with blades forward. Take rowlocks out of sockets. Bring lifelines in.

TOSS OARS: Complete the stroke, come to "oars," raise the oars smartly to the vertical, rest handles on footings, and trim blades fore and aft.

To Change Position in Lifeboat

BANK OARS: Pull oars across boat.

PORTSIDE CHANGE: Portside moves to bow one seat.

STARBOARD SIDE CHANGE: Starboard moves to stern and coxswains change.

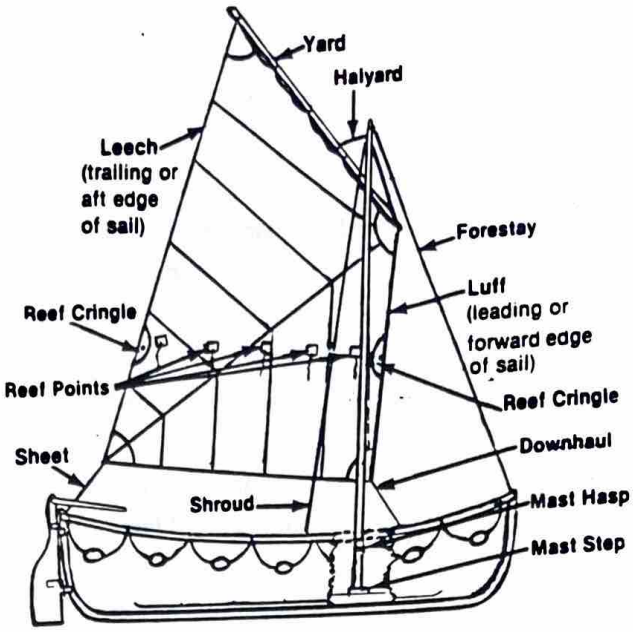
Sails

A **standing lug rig** with spars (support poles) and equipment is provided on all lifeboats. (See Figure 2-17.)

The sail is colored **Indian Orange**, so it stands out against the sea. There must be a cover to protect the sail from the weather when it is not in use. Sails should be aired often to avoid mildew.

The butt of the **mast** fits into the **mast step** in the bottom of the boat. Directly above it, a hinged **mast hasp** closes upon the mast to hold it upright when the mast is "stepped." To hold the top of the mast steady there are three **galvanized wire** ropes of **not less than three-sixteenths of an inch in diameter**. One runs to the bow shackle and is called the **forestay**. The other two, called **shrouds**, run to each gunwale.

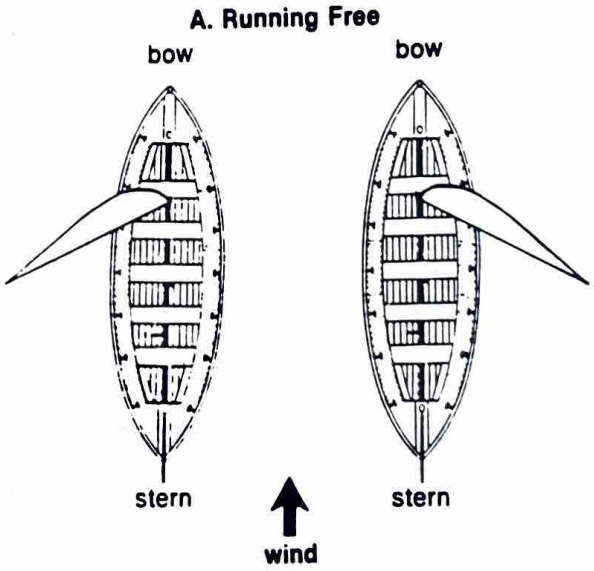
Reef points are small lanyards (strings) attached at reinforced points on the sail fabric. To "**reef the sail**" you roll the fabric up from the bottom and tie it in place at the reef points. Doing this reduces the sail area and lessens the danger of capsizing the boat in a very strong wind. Note that the two lines which secure the bottom corners of the lug sail (the **sheet** and the **downhaul**) must be re-tied at the new "corners" of the reefed sail, the **reef cringles.**



Lifeboat Sail
Figure 2-17

The head (top edge) of the **lug sail** is laced to a spar called the **yard**. The yard, together with the attached sail, is hoisted by pulling down on the **halyard** line which runs through a sheave at the top of the mast. To hold the sail up, tie off the halyard on a small cleat near the bottom of the mast. To douse (lower) the sail, uncleat the halyard and pull down on the sail.

The **sheet** is a line attached to the rear corner (the **clew**) of the lug sail. The sheet is the control line used by the helmsman to adjust the angle of the sail to the wind. The helmsman must be prepared to release the sheet if a sudden wind burst threatens to capsize the boat.



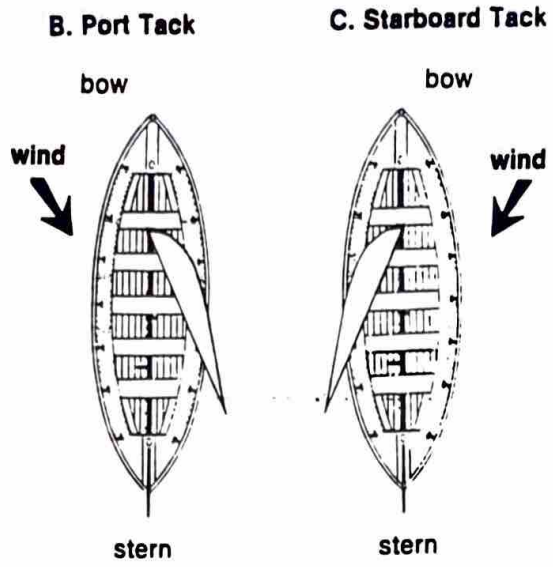
Sailing Maneuvers
Figure 2-18

Some terms used in sailing are:

1) **Running free** - sailing with the wind coming from aft of the boat. (See figure 2-18A.)

2) **Port Tack** - sailing with the wind coming over the port side of the boat. (See figure 2-18B.)

3) **Starboard tack** - sailing with the wind coming over the starboard side. (See figure 2-18C.)



L. Enclosed Lifeboats

In the future, more ships will be carrying completely enclosed lifeboats. Most enclosed lifeboats have the following features:

1. For **external fire protection**, a pump driven off the engine pumps sea water to spray nozzles along the top of the cover. This keeps the entire survival craft completely wet. The boat is usually made of fire retardant, fiberglass-reinforced plastic, so it will not burn easily.

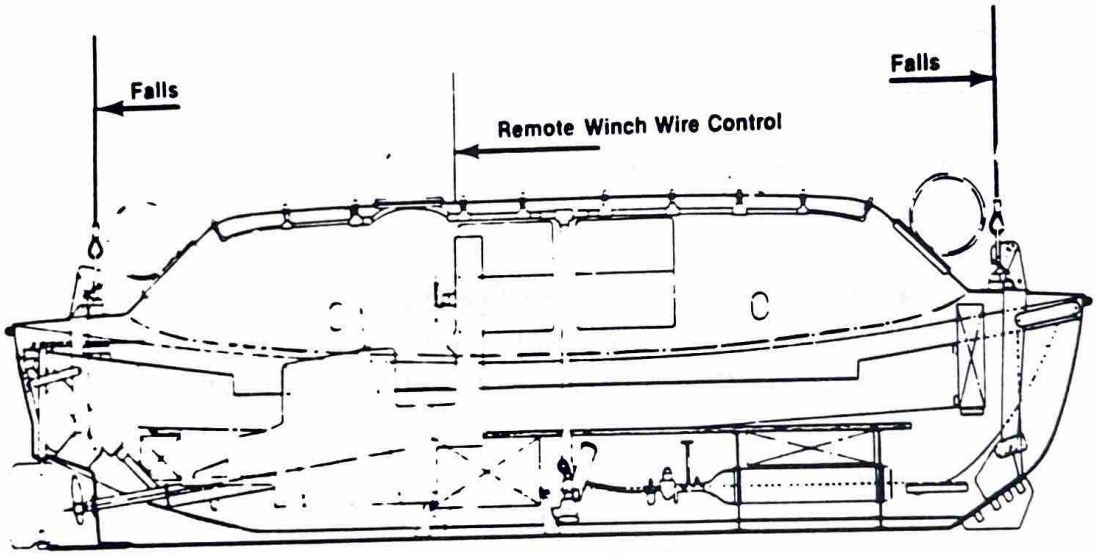
2. A **tank of compressed air** is provided to supply air to the survivors and engine. If it is necessary to close down for fire survival, this air supply will last for **ten minutes**. A slight positive pressure is built up inside the craft to keep out fumes and gases. Air is not recirculated.

3. **Ventilators** are designed to automatically close if the boat capsizes. The ventilators should be closed by hand if it is necessary for the uprightcraft to pass through fire.

4. Most covered lifeboats will **right themselves** if they capsize. If the people inside are wearing their seat belts properly, they become ballast for the boat. This ballast will turn the boat right side up. If the people inside are not wearing seat belts, they will fall into the overhead. **This will make the boat stay upside down.** People could get hurt or drown. Remember, if there is a danger of the boat capsizing, **you must wear your seat belts.**

5. Also, most enclosed lifeboats have:

   A. a steering wheel inside.
   B. watertight access doors and escape hatches.
   C. non-skid deck surfaces.
   D. International Orange exterior color.
   E. a hydraulic start diesel engine and four oars.
   F. oar ports (which can be closed) for rowing.
   G. remote winch wire control.

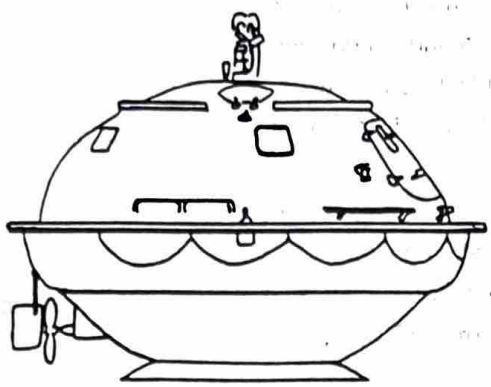


Interior Layout of a Totally Enclosed Lifeboat
(Compliments of Watercraft America, Inc.)
Figure 2-20

M. Survival Capsules

Survival capsules are found on oil rig platforms. Survival capsules have the same safety features as enclosed lifeboats such as fire retardant construction, sprinkler system, seat belts, and a self-righting design.

Large capsules are oval. Smaller capsules are round. They have only one fall wire and Rottmer releasing hook located in the center of the capsule. The capsule must never be towed by the releasing hook. The capsule should only be towed by the bow towing bridle along the gunwale to prevent capsizing.



Survival Capsule
(sketch compliments of Whitaker Corp.)
Figure 2-21

Immediately after people board for emergency evacuation, they should fasten their seat belts and close all doors, hatch covers and vents. If this is done, the capsule should right itself if it capsizes in heavy seas. If the capsule does remain capsized, it can be righted by an **inflatable bag** that is installed on the top of the dome if so equipped. It is designed to right the capsule when the doors and hatchways are closed, and the occupants are strapped in their seats. The bag is inflated by pulling a handle inside the capsule.

See the section on **Oil Rig/Platform Davits** for capsule launching procedures.

N. Lifeboat Equipment

Lifeboats are provided with standard equipment to help you **1) handle the lifeboats, 2) survive at sea, and 3) alert rescuers.** Coast Guard rules and regulations for your specific class of vessel determine what equipment and provisions are required to be carried in each of your lifeboats. The following list is for ocean and coastwise ships. Vessels on the lakes, bays, sounds, and rivers have less equipment. Equipment for ocean going barges may also differ.

Regulations require that the equipment be maintained in good and serviceable condition and be readily available at all times.

Locker

A small compartment called a **locker** is used for stowing small items of equipment. This locker protects lifeboat equipment from the weather.

Sea Painters

Two **painters** (lines) at least **2¾-inches** in circumference made of manila fiber or equal strength line are provided. The painters must be at least **three times as long as the distance between the boat deck and the ship's waterline when the ship is light.** See the section on davits for an explanation of the purpose for the painters.

Storm Oil

One gallon of vegetable, fish or animal oil is provided and carried in the metal container fitted at the apex (point) of the sea anchor or drogue.

Oil is intended to prevent the wave crests from breaking and delay the development of the smaller waves. Only the underlying swell remains. Oil reduces the drag of the wind on the water. Mineral oil, such as fuel or lube oil, may be used, but it is less effective.

Sea Anchor (drogue)

One **sea anchor** is provided. A sea anchor is also called a **drogue.** It is a cone-shaped, canvas device with tripping and holding lines attached. (See Figure 2-22)

If you are adrift in the open ocean, the sea anchor increases your chances for survival in three important ways:

(1) When properly set, the drogue will point your bow into the wind and seas. This will keep you from **broaching** (turning sideways to the wind and seas). If your boat broaches in heavy weather, you are in grave danger of **capsizing** (overturning).

(2) A properly set drogue will not stop your lifeboat from drifting, but it will slow it down. This will keep you closer to where your ship sank, thus making it likely that rescuers will more quickly locate you.

(3) A metal **storm oil container** inside the canvas drogue contains storm oil, which can help you stay drier by spreading an oil slick to windward of the open lifeboat. The **petcock** (valve) controls the amount of storm oil that can be released from the **apex.** The storm oil helps reduce friction between the wind and the surface of the water. This keeps the sea from "breaking" (forming little droplets) which the wind then blows onto you in the boat. A drier lifeboat passenger is less likely to perish from hypothermia (loss of body heat).

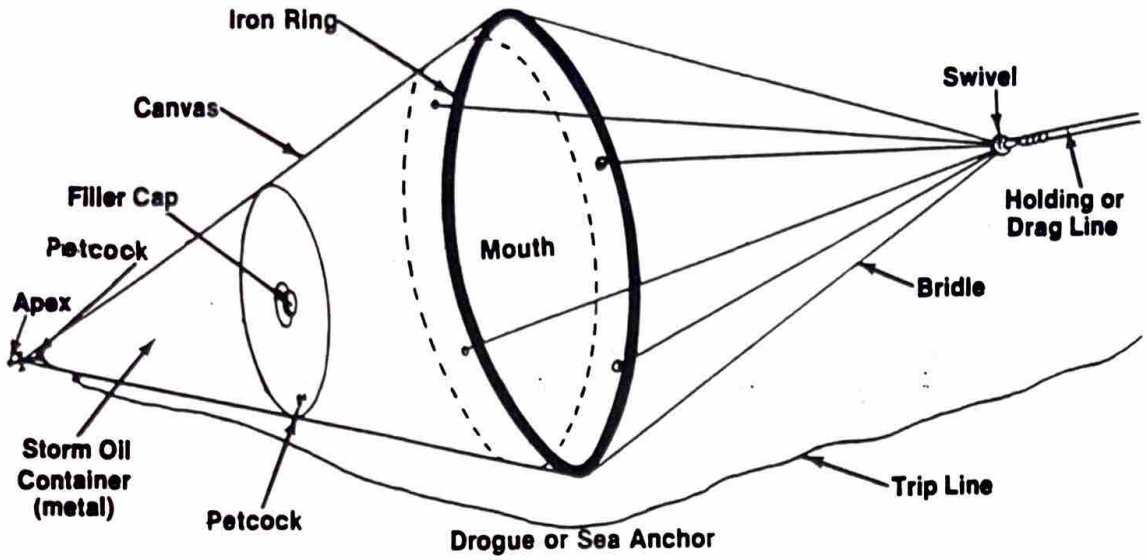


Figure 2-22

The sea anchor is trailed out from the bow or stern of the lifeboat to hold that end of the boat into the sea. The cone fills with water and creates a drag on the lifeboat. To create the most drag, the holding line should be towed while slacking (letting out) the **tripping line**. (This trip line is only fifteen feet long; it must be lengthened by attaching the heaving line or other available line.)

The sea anchor can be recovered (brought back into the lifeboat) by pulling on the **tripping line**. This will bring the apex forward and empty the sea anchor of water, allowing it to be pulled into the boat.

If the sea anchor is lost or damaged, an emergency one may be made by using a boat bucket, an air tank filled with water, or two oars and canvas lashed together and weighted down.

Heaving line

One heaving line of one-inch circumference buoyant rope is provided. It is **ten fathoms (sixty feet) long**. The heaving line may be used to lengthen the tripping line on the sea anchor, to add to the length of the boat painters, or for other needs which may arise.

Boathooks

Two boathooks, wooden poles tipped with a metal ballpoint and hook, are provided. One should be available for use in the bow and the other in the stern of the lifeboat. These poles are used for fending off, hooking falls when coming alongside, etc.

On small lifeboats (less than 23 feet), the boathook handles need be only eight feet long. Ten foot long handles are required on lifeboats between 23 and 29 feet. Large Lifeboats (more than 29 feet long) are required to have boathooks twelve feet long.

Hatchets

Two hatchets, secured by lanyards at each end of the lifeboat, are provided. They are used for cutting falls or painters, if this becomes necessary.

Bailer

One bailer, a device similar to a dustpan, is provided. It is used to rid the lifeboat of water.

Bilge pump

One pump, fitted with a hose, strainer and foot valve, is provided. It is operated by a back and forth or rotary motion of the operating lever. These pumps are designed to rid the boat of water with less effort than bailing.

Buckets

Two galvanized buckets are provided. Each bucket should have a six-foot lanyard of twelve-thread line attached.

Buckets can be used for bailing out the lifeboat, as emergency sea anchors, and for other needs which may arise. A frequent misuse of buckets is for stowage of lanterns or similar equipment. Water may accumulate (gather) in an upright bucket lashed under a thwart. That would damage the equipment left in it.

Protective Cover

One canvass cover for each open lifeboat is provided. This is a highly visible color Indian orangeand shelters the occupants from exposure. The cover is spread over portable frames set in sockets along each side of the boat. This protective cover is not the same as the storage cover spread over the boat when it is in the davits on the ship.

Fishing Kit

One approved fishing kit is provided.

First Aid Kit

A first aid kit containing bandages, an eye dressing with ointment, a tourniquet, forceps, scissors, safety pins, a wire splint, ammonia inhalants, iodine applicators, APX compound (aspirin, phenacetin, and caffeine), and petrolatum gauze is provided. Instructions for the use of the contents of the first aid kit are attached to the inside of the cover.

Provisions

Two pounds of hard bread or its approved nutritional equivalent is provided for each person the lifeboat is supposed to carry. These provisions should be stowed in the lifeboat locker.

Condensed Milk

One pound of condensed milk is provided for each person. The milk should be kept in the lifeboat locker.

Water

Three quarts of water are provided for each person the lifeboat is supposed to carry. The three quarts of water are contained in nine sealed cans and should be stored in the lifeboat locker. They should be replaced after **five years.**

Desalting Kit

One or more approved desalting kits or solar stills **may** be provided to substitute for **one third** of the required amount of drinking water per person.

Jackknife

One jackknife is provided. One of the blades is a can opener for opening food and water tins.

Drinking Cup

One enamel or plastic drinking cup with a three foot lanyard of 1/8 inch cotton line is provided. The cup should be marked in ounces.

Flashlight

One waterproof flashlight with three spare cells (or one 3-cell spare) and two spare bulbs are provided. The approved flashlight must be designed so it can be used for blinker signalling. During the annual overhaul of the lifeboat, the batteries must be replaced.

Lantern

A lantern containing enough oil to burn for nine hours is provided. The lantern should be kept ready for immediate use and when displayed should be high on the mast or a spare oar.

Illuminating Oil

One extra quart of oil is provided for refilling the lifeboat lantern if it becomes necessary. (This allows an extra 9 hours of lantern operation.)

Matches

Matches are provided. In order to keep them dry, use a watertight can stowed in the locker or under the stern thwart.

Life Preservers

In addition to those provided on board ship for each crew member, two extra life preservers are provided. They are to be used for survivors who are picked up out of the water.

Table of Lifesaving Signals

A table of lifesaving signals printed on water resistant paper is provided. This table must be in accordance with the provisions of Chapter V, Regulation 16, of the International Convention for Safety of Life at Sea, 1960. (See Figure 5-7.)

Floating Orange Smoke Distress Signals

Two cans which give off orange smoke are provided. This orange smoke alerts rescue planes and ships to the presence of the lifeboat. They should be replaced after **three years from date of manufacture.** The date and expiration appear on the label of the signal. These distress signals are ignited by means of a pull wire and are then thrown overboard on the leeward side. They should be **used only in daylight** when a rescue vessel or plane is sighted by the occupants in the lifeboat.

Red Rocket Parachute Flares

Twelve hand-held, rocket propelled parachute flares (or a signal pistol with twelve red rocket parachute flare cartridges) are provided. These red flares reach several hundred feet above the water and can be seen at night for considerable distance on the horizon. They are approved for use within **three years from the date of manufacture.** Date of manufacture and expiration appear on the label of the signal.

Red Hand-Held Distress Signals

Twelve hand-held distress flares are provided. Most are ignited by removing the cap and then scratching the button on the flare against the scratch surface on the cap. Once lit, the flares will alert rescure vessels. They should be replaced **three years from date of manufacture.** Dates of manufacture and expiration appear on the label of the signal.

Signalling Mirror

A mirror used to attract rescue ships and planes to the location of the lifeboat is provided. There are several types. The instructions for using a particular mirror will be found on its packaging.

Compass

A small magnetic compass is provided in each lifeboat. Itshould be placed **on the centerline** in the stern of an open boat or near the operating station of an enclosed boat, so the coxswain can see it.

Instructions for removing error from the compass are given on the container and should be read carefully. See the section entitled **Navigating by Compass** for more information on compasses.

Gunwale Ladder

One ladder is provided for lifeboats. It should be secured about midship on the lifeboat and ready for immediate use.

Ditty Bag

A canvas bag containing a sailmaker's palm, needles, sail twine, marline and a marlinespike is provided on all lifeboats.

Fire Extinguishers

Two fire extinguishers, CO_2 or dry chemical, are provided for motor propelled lifeboats. They are stowed at each end of the lifeboat.

Tool Kit

A tool kit is provided for all motor propelled lifeboats. It contains one twelve ounce ball peen hammer, one screwdriver with a six inch blade, one pair of eight inch slip-joint pliers and one eight inch adustable end wrench.

A check-off list can be used to assure that all the equipment required is in the boat. Additional equipment may be carried in lifeboats only if it does not overload the davits or interfere with seating or the seaworthiness of the boat.

O. Davits and Winches

Weekly lifeboat drills are required by U.S. law. These drills are required so that the crew is well trained to lower and raise the lifeboats and to be sure that the davits, winches, lifeboats and required equipment are operating properly. The ship's passengers are also expected to muster at their assigned boats and to take part in the drills.

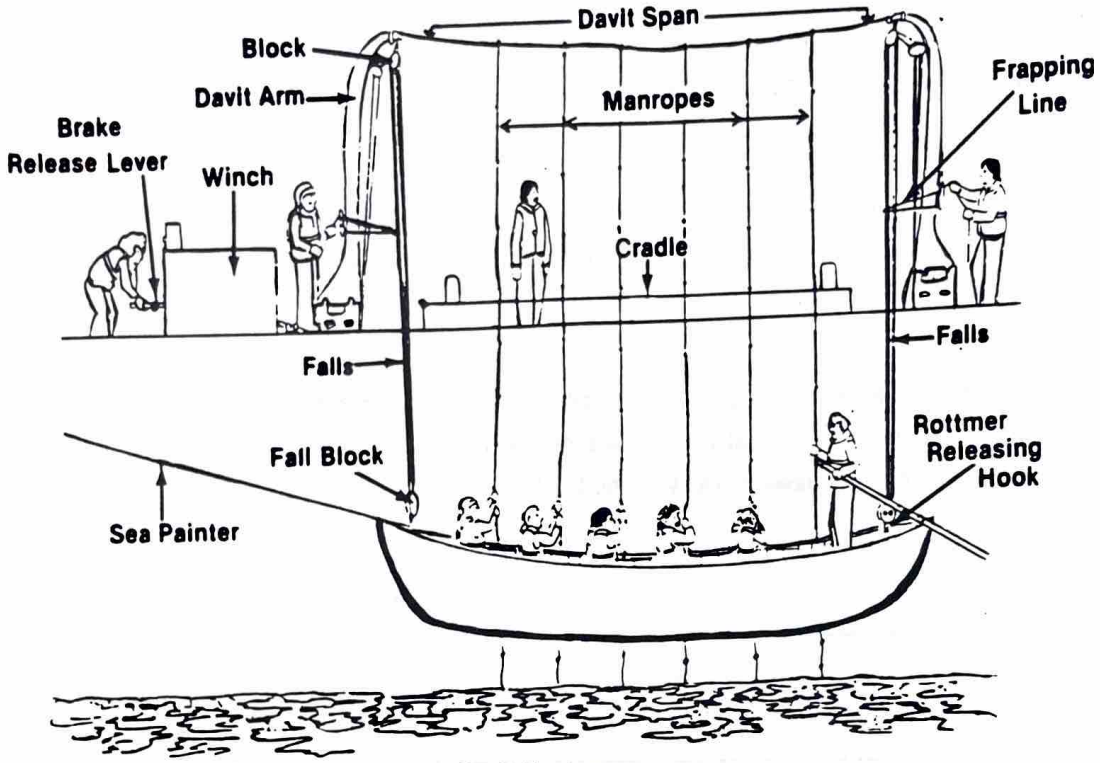
The ship's master is responsible to see that each lifeboat is lowered to the water at least once **every three months.** In addition, he must be sure that the fully loaded boat is lowered to the water until it is afloat and then released at least **once every year.**

Davits are installed on both sides of the ship. They are designed to swing the lifeboat over the water and to lower or raise the lifeboat to and from the water. A lifeboat launched by wire falls requires a winch with its two davits. Some winches use hand-held air or electric drills for hoisting power. Winches are discussed on page 31.

P. Common Features of Davit Systems

FALLS

Falls are the ropes **(wire or fiber)** used in hoisting and lowering lifeboats. They are secured to the davit and lifeboat releasing hooks.



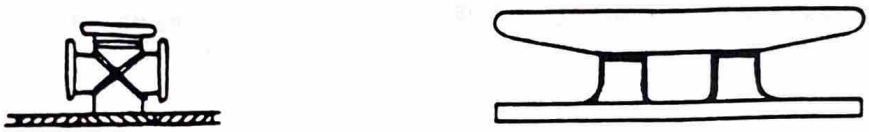
Davit System
Figure 2-23

Davits which have winches must have wire rope falls of 6 x 19 regular lay filler wire construction. The falls must be prelubricated at the factory with neutral wire rope lubricant. Falls, when replaced, require wire of the same size and type as originally approved. In addition, close attention is needed with any poured metal socket fittings used with wire.

The bottom end of wire rope falls are connected to the winch drum. The falls are then led through **sheaves** (pulley wheels) to the davit arms and through large blocks. The **fall block rings** are hooked into the **Rottmer releasing hooks** on each end of the lifeboat. The sheaves for the falls must have a diameter at the base of the groove equal to at least **twelve times the diameter of the wire rope.** Blocks and falls used as lifeboat gear must be designed with a **minimum safety factor of six, based on the maximum working load.**

An almost predictable number of failures of wire rope falls occurs each year. In fact, wire rope falls can be termed the most dangerous item on a merchant ship. This stems primarily from a lack of maintenance. The wires are not adequately lubricated, so they corrode internally and lose their flexibility. Their failure will occur most often when the boats are hoisted aboard after lifeboat drill. Boat crews would be well advised to remove themselves from a boat before it is hoisted aboard. To prevent this danger, wire rope falls must be kept coated with a grease that provides both lubrication for the internal (inside) working of the wire and protection against corrosion. Care must be taken to lubricate all of the falls including the wire around the sheaves and winch drum. The davit must be lowered to expose these normally hidden areas.

Davits that do not use winches have falls of **manila rope or** equivalent **fiber rope.** Fiber rope falls are protected from the weather by stowing them in covered tubs, boxes, or reels. It is best to **end-for-end** (reverse) **fiber rope falls every year** and completely **replace them every two years.** Fiber rope falls are paid out (lowered) over **cruciform bitts** or **cleats.**

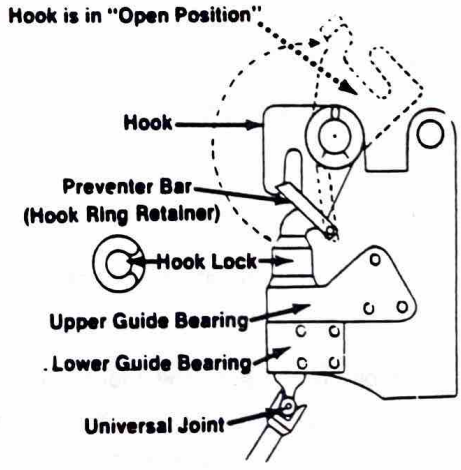


Cruciform Bitt and Cleat
Figure 2-24

Releasing Gear

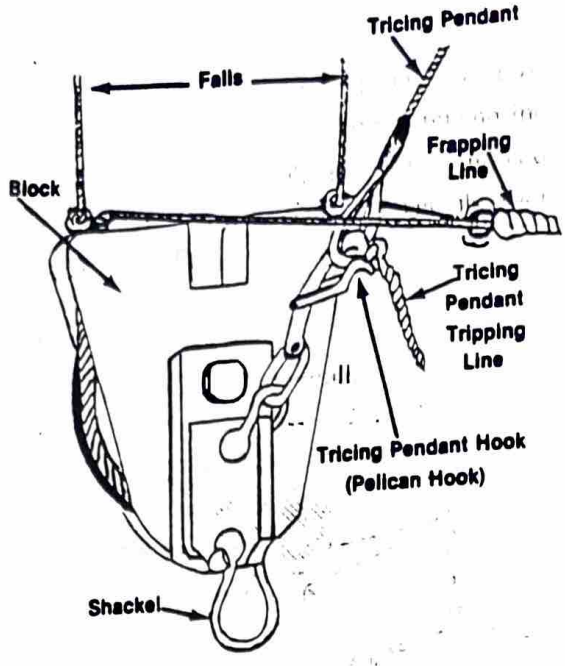
The falls blocks are attached at each end of the boat to the **Rottmer releasing hooks** (See Figure 2-25) with **hook rings.** The hooks are part of the boat's Rottmer releasing system. The hook rings are permanently fastened to the **falls blocks.** (See Figure 2-40.)

The purpose of the Rottmer releasing system is to make certain that both ends of the lifeboat are released from the falls at the same instant. If the ship were rolling in heavy seas, it would be disasterous for one end of a lifeboat to remain attached to the vessel while the other were released. The Rottmer releasing system



Rottmer Releasing Hook
Figure 2-25

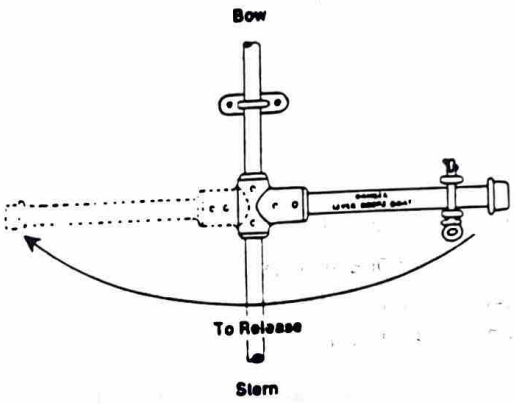
releases both ends of the boat at the same time. The lifeboat coxswain orders the boat to be released. A crewman in the boat turns the **releasing lever (See Figure 2-26 and Figure 2-27.)** The lever turns a metal shaft which is connected to the releasing hooks at both ends of the boat. This action causes the hook lock to open. When the hook lock opens, the hooks open, and the falls are released.



Releasing Lever
Figure 2-26

Each Rottmer releasing hook has a set of **preventer bar,** also known as **hook ring retainers,** to prevent the hook rings from accidentally falling out of the hooks before the releasing lever is released.

The releasing lever is painted **red** and labled **DANGER - LEVER DROPS BOAT.** There is a **twelve inch wide, white stripe** where the release lever is located. This stripe runs from the keel to the sidebenches.



Rottmer Releasing Lever
Figure 2-27

The person-in-charge of the lifeboat must be sure that all members of his crew know that turning the lever at the wrong time could drop the boat. If this happened at a great height, it could seriously injure those in the boat. Therefore, **only the coxswain gives the command to release the falls.** Persons working or painting within the boat must not disturb the controls of the releasing gear.

Davit Span

The davit span is a length of wire between the tops of the two davit arms. The manropes are suspended from the davit span.

Manropes

Davits have at least two **manropes** (sometimes called lifelines) attached to the davit span above an open lifeboat. Manropes are manila or fiber rope and have figure 8 knots spaced about three feet apart.

Manropes have two purposes:

(1) To give the crew something to hold onto while the boat is being lowered and raised. Incase the falls part break, the crew would not fall with the boat but could climb the manropes to safety.

(2) To be used by the davit crew to enter the boat if the embarkation ladder is missing or damaged.

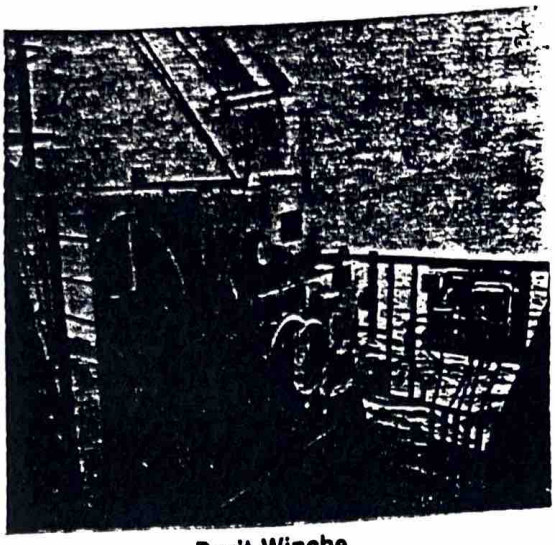
In enclosed lifeboats, seat belts take the place of manropes to secure persons from the hazards of rapid movement.

Frapping Lines

Fiber ropes are passed around the falls to help control the swinging of the lifeboat when lowering and raising the boat.These are called **frapping lines.** Frapping lines are secured with figure 8 turns to cleats mounted on the davit arms.

Normally, frapping lines have **athwartship leads.** If the ship is pitching (with heavy seas from ahead or astern), as well as rolling, frapping lines should have **fore and aft (45 degree angle) leads.** This will help control the boat's tendency to swing fore and aft. If it is very rough, nothing is going to stop the boat from swinging and hitting the ship's side. When it is that rough, fenders or anything available (such as mattresses or cushions) should be hung over the side to cushion the impact.

Winches



Davit Winche
Figure 2-28

On all vessels in ocean and coastwise service, davit **winches** must be fitted if the height of the deck on which the lifeboats are carried exceeds **twenty feet** from the lightest sea going draft of the vessel. If winches are fitted, the falls must be wire rope. A winch has a **hand brake** (see figure 2-28) for controlling the speed at which the falls are lowered. In addition, there must be a **governor brake** capable of automatically controlling the lowering of a fully equipped and fully loaded lifeboat to a maximum speed of not more than **120 feet per minute.** A motor or hand crank can be used to reel in the falls. The **hand crank** will automatically disengage (not work) if the motor starts to turn the winch. Even though the hand crank is automatically disengaged, it should always be removed when it is not being used to prevent it from flying free and injuring someone. When using the hand crank, always make sure the power is secured to the winch by putting the **emergency disconnect switch** in the **off** position.

If winches are not properly covered and lubricated, moisture from condensation can gather in the electric winch motor and damage the electrical wiring. In cold weather, the moisture could freeze the gears and prevent the lowering of the lifeboat. Covers should be put over winches to keep ice and snow from freezing on the wire falls.

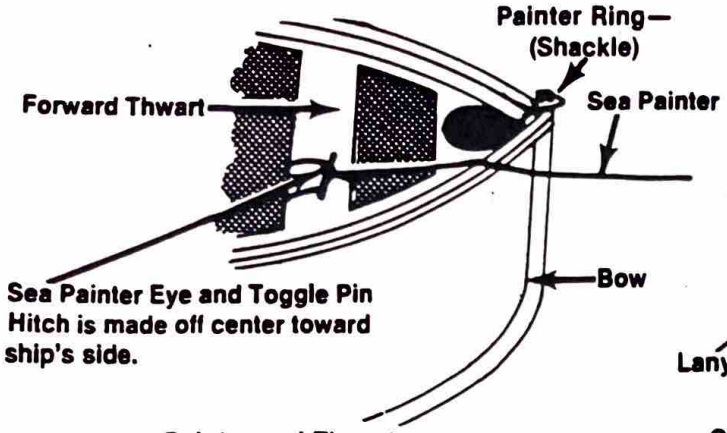
Winches may be either electric or pneumatic (air-powered). Some use air or electrical drills as portable sources of power.

Painters

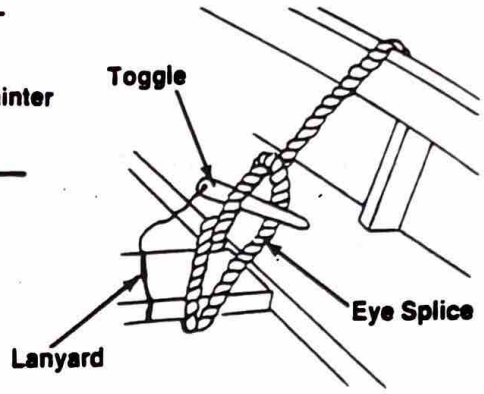
Lifeboats have two types of painters: **boat painters** and **sea painters.** Boat painters are manila ropes at least 2 3/4 inches in circumference. They are attached to painters rings or shackles at the stem or stern of the lifeboat. They are used for tying up at a dock.

The **sea painter** is also a manila rope at least **2 3/4 inches in circumference.** It has a long eye splice in one end. The length of the sea painter must be **3 times the distance between the boat deck** (the deck where the lifeboat is stowed) **and the light water line** (when the ship is not loaded with cargo or ballast).

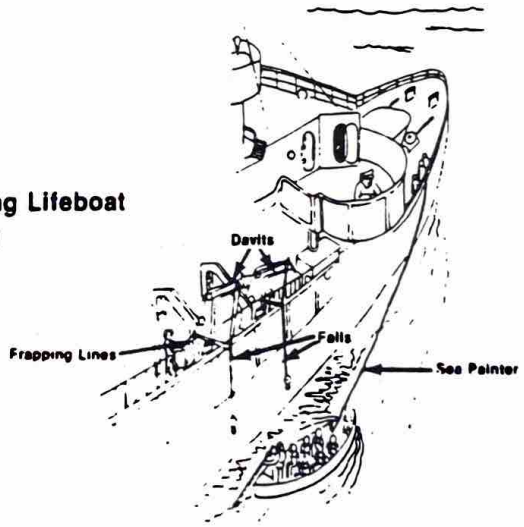
The sea painter is attached to the forward inboard thwart with a **toggle** (see figure 2-30). The toggle allows the sea painter to be released quickly and safely. An enclosed lifeboat has its forward thwart under cover so the sea painter and toggle are secured to a ring bolt and shackle found on the inboard gunwale.



Painter and Thwart
Figure 2-29



Close-up of Painter and Thwart
Figure 2-30



Launching/Recovering Lifeboat
Figure 2-31

In launching or recovering a lifeboat, the opposite end of the sea painter is led forward and outboard of all obstructions on the ship. It is secured with figure 8 turns to a cleat or other strong point. (See Figure 2-31.)

The ship may launch and recover lifeboats while the ship is slowly moving through the water. When this is done, only one of the painters should be used. When the boat is released into the water, the sea painter (attached to the forward thwart with the toggle) tows the boat alongside the ship.

While the boat is being towed on the sea painter, the coxswain sheers (swerves) the boat away from the ship's side at a 45 degree angle. The oars are made ready to give way, or the propeller is put ahead. The toggle is pulled out of the eye of the sea painter at the coxswain's command. The sea painter is cast into the water and is retrieved by the ship's crew. The lifeboat is then underway under its own power.

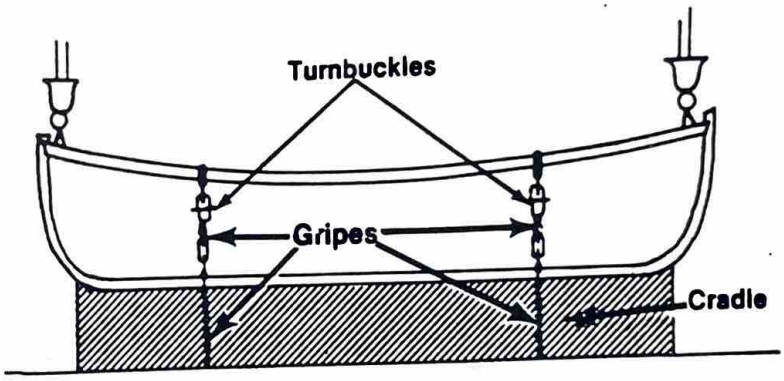
To retrieve the lifeboat from the water, the boat must go ahead of the davits where the sea painter is passed from the ship to the boat. The bow man resecures it to the thwart with the toggle. While the boat is being towed by the sea painter, the coxswain slows the boat down and steers it under the falls. The boat is now being towed under the falls, so the falls can be safely secured to the Rottmer hooks for raising the boat.

CRADLES

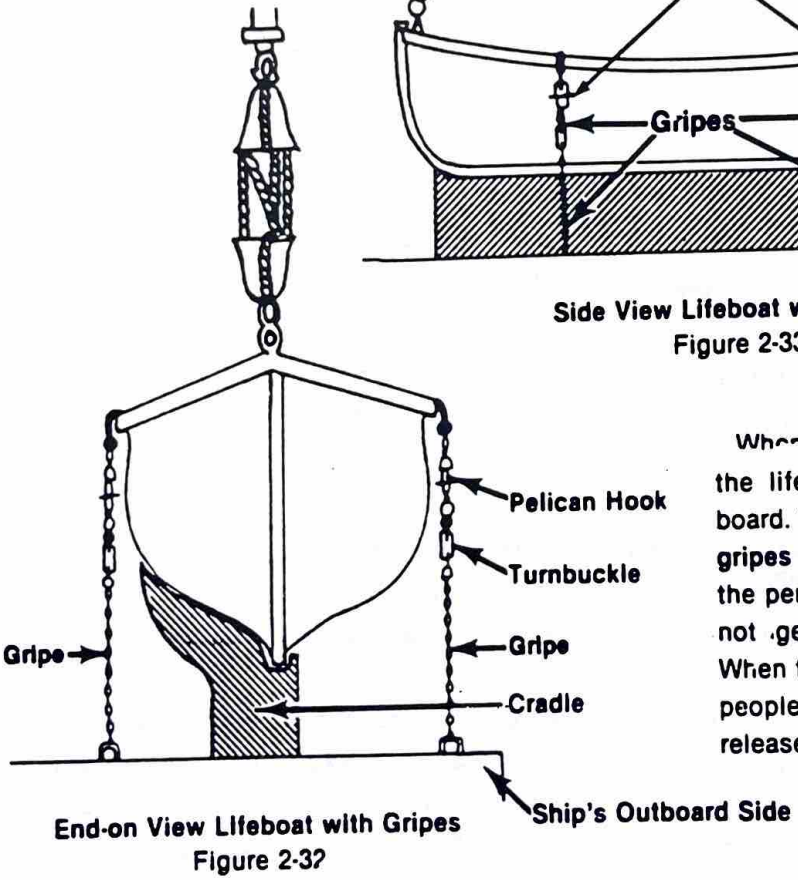
Cradles are heavy wooden or metal fittings secured to the ship. Cradles are shaped to fit the bottom of the lifeboat. Doubler plating is found on the hull plating of the lifeboat where the lifeboat rests in the cradle.

GRIPES

Lifeboats are secured in the stowed position with **gripes.** Lifeboats which rest on cradles on the deck of a ship are equipped with **gunwale gripes.** Radial and mechanical davits have four gunwale gripes. Gravity davits have two gripes which are called **belly gripes.** Gripes are adjusted by **turnbuckles.**



Side View Lifeboat with Gripes
Figure 2-33



End-on View Lifeboat with Gripes
Figure 2-34

When all four gripes are released the lifeboat will list (swing) outboard. **Therefore, the two outboard gripes should be released first,** so the persons assigned that job will not get knocked over the side. When the outboard side is clear of people, the inboard gripes may be released.

Q. Types of Davits

The major types of shipboard davits are:

1. **Radial davits**
2. **Mechanical davits**
   a. Quadrantal davits
   b.Sheath screw davits
      (1) straight boom davits
      (2) crescent davits
3. **Gravity davits**
   a. Single pivot davits
   b. Miranda (MIR) davits
   c. Roller davits

The name of the davit tells you how the lifeboat is moved from its cradle to the outboard position for launching. Once the lifeboat is hanging over the water, all three davit types use gravity to lower the boat to the water. The falls on the davits that **do not** have a winch (some radial and mechanical davits) are paid out over cruciform bitts or cleats and raised by pulling in on the fiber rope falls. Davits that **do** have electric powered winches (all gravity and most others) have a brake release lever that is raised, allowing the winch drum to pay out the wire rope falls. The winch also raises the falls.

Radial Davits

The heads of the davit arms on **radial davits** are swung out in **horizontal arcs.** This moves the boat from an inboard to outboard position. The boat is swung aft until the bow clears the forward davit arm. The boat is then swung outboard and forward to the lowering position. When the ship is listing (tilting) heavily, hand-turning-out gears may be used to be sure the boat gets swung outboard. It is difficult to swing out a heavy boat with a radial davit, so only small vessels are allowed to carry radial davits. Figure 2-32 shows a davit of this type in both the stowed and launching positions.

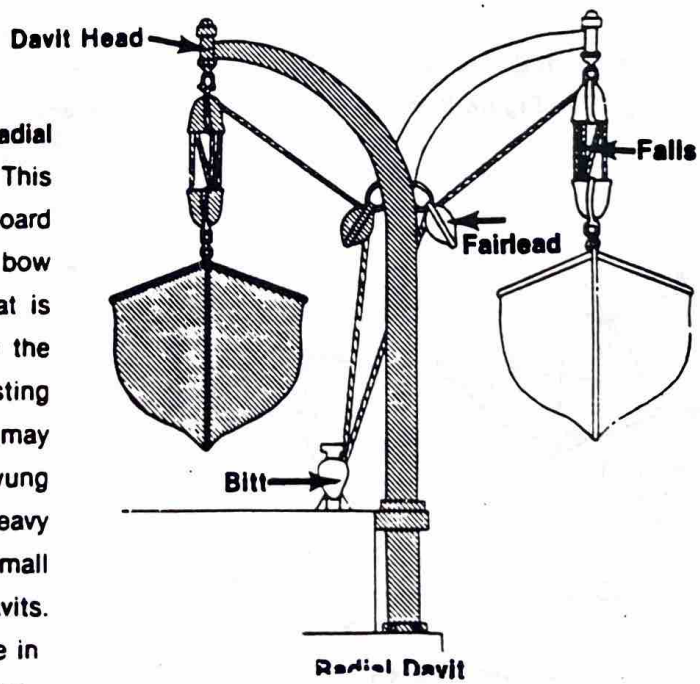
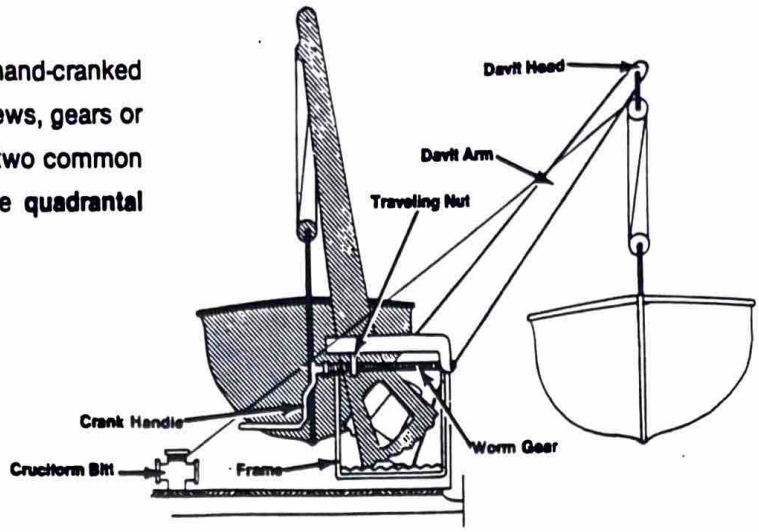


Figure 2-34

Mechanical Davits

Mechanical davit arms are hand-cranked out over the ship's side by screws, gears or other mechanical means. The two common types of mechanical davits are **quadrantal** and **sheath screw.**



Quadrantal Davit
Figure 2-35

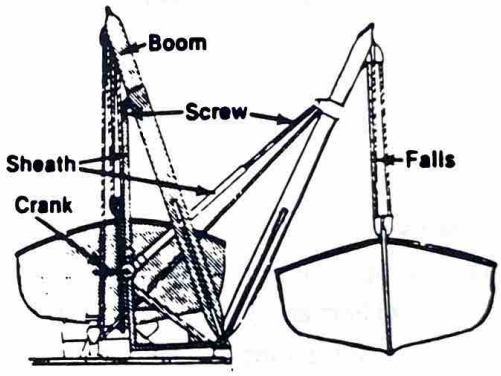
a. **Quadrantal Davits**

The quadrantal davit is cranked outboard by a large horizonal worm gear with a traveling nut. (See Figure 2-35.)

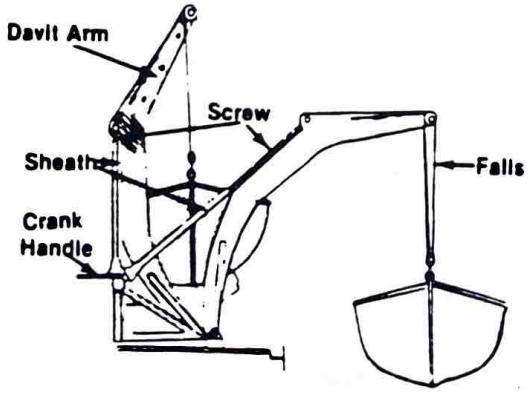
b. **Sheath Screw Davits**

The sheath screw davit is cranked outboard by a large vertical screw with a metal sheath enclosing the screw. Two types of sheath screw davits are (a) straight boom and (b) crescent.

(1) **Straight boom davits** have straight davit arms. (See Figure 2-36.)



Sheath Screw Boom
Figure 2-36



Sheath Screw Crescent
Figure 2-37

(2) **Crescent type davits** have davit arms shaped liked a crescent moon. (See Figure 2-37.)

Crew of Nine Launching a Lifeboat From A Mechanical Davit

- Coxswain
- Winch/Brake operator
- Gripe tenders (two persons)
- Frapping line tenders (two persons)
- Sea painter tender
- Bow person
- Stern person

Follow these steps:

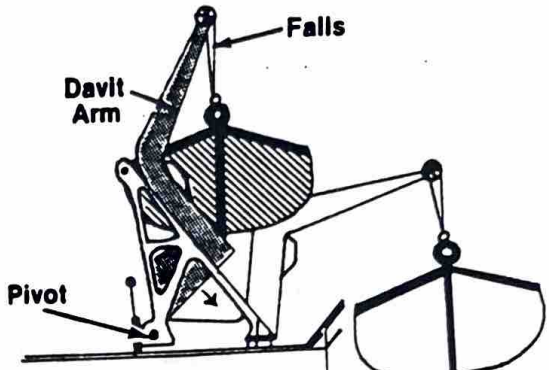
1. Remove the boat cover and ridgepole supports.
2. Put the cap on the boat drain.
3. Lead the sea painter forward. Ship the rudder and tiller.
4. Pass the frapping lines around the falls.
5. Release the outboard gripes first, so the person assigned this job will not get knocked into the water. Release the inboard gripes last.
6. When the falls are taut (tight), the davit arms can be cranked out over the water.
7. The bow and stern persons hang the manropes to the water on the inboard side of the lifeboat.
8. Raise the brake release lever to lower the boat to the embarkation deck.
9. Crank the davit arms, so the lifeboat is against the side of the ship at the embarkation deck. Keep the slack out of the frapping lines.
10. Passengers embark. Crank the davit arms, so the lifeboat is clear of the ship's side.
11. Raise the brake lever to lower the boat.
12. Stop lowering the boat when the boat is just above the crest of the highest wave or swell.
13. Coxswain gives the order to release the boat on the crest of the waves.
14. Coxswain works the boat away from the ship's side.
15. Sea painter is released.

Gravity Davits

The most common and easily operated davits are the **gravity davits.** Gravity davits move the boat from the inboard to the outboard position by lifting the **winch brake release lever** or pulling the **launch control wire.** Gravity is the force which moves the boat from the inboard to the outboard position and then lowers the boat to the water. The three types of gravity davits are (a) single pivot gravity davit, (b) Miranda gravity davit and (c) roller gravity davit.

(a) **Single Pivot Gravity Davits**

Single pivot point gravity davits have two davit arms which pivot at the lower ends and move outboard through mechanical linkages. (See Figure 2-38.)

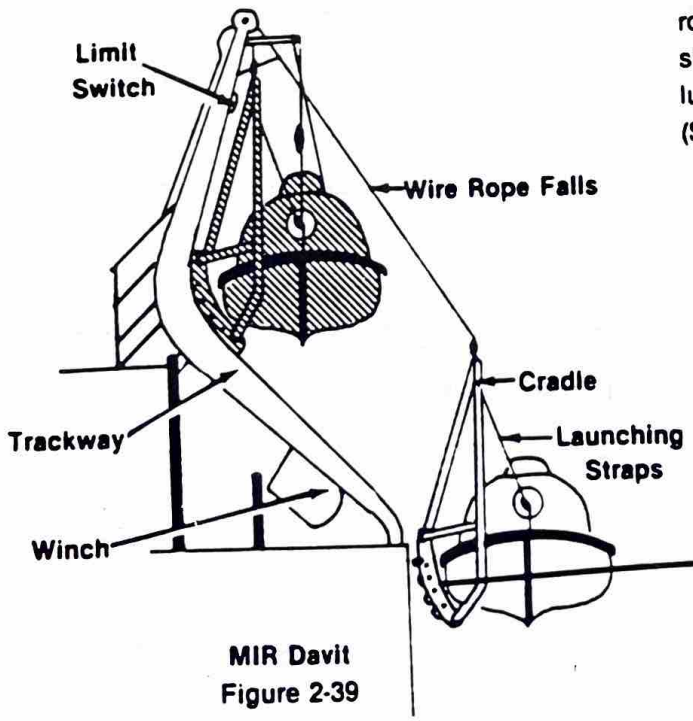


Single Pivot
Figure 2-38

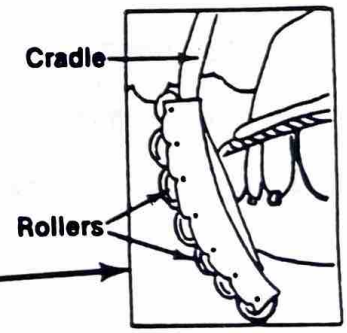
(b) **Miranda (MIR) Gravity Davits**

MIR gravity davits hold the boat in a cradle. This cradle rides along inclined trackways all the way into the water. (See Figure 2-39.)

The Miranda cradle has rollers which roll down the trackway and then down the ship's side into the water. Regular lubrication of these rollers is necessary. (See Figure 2-40.)



MIR Davit
Figure 2-39



MIR Cradle
Figure 2-40

(c) **Roller Gravity Davit**

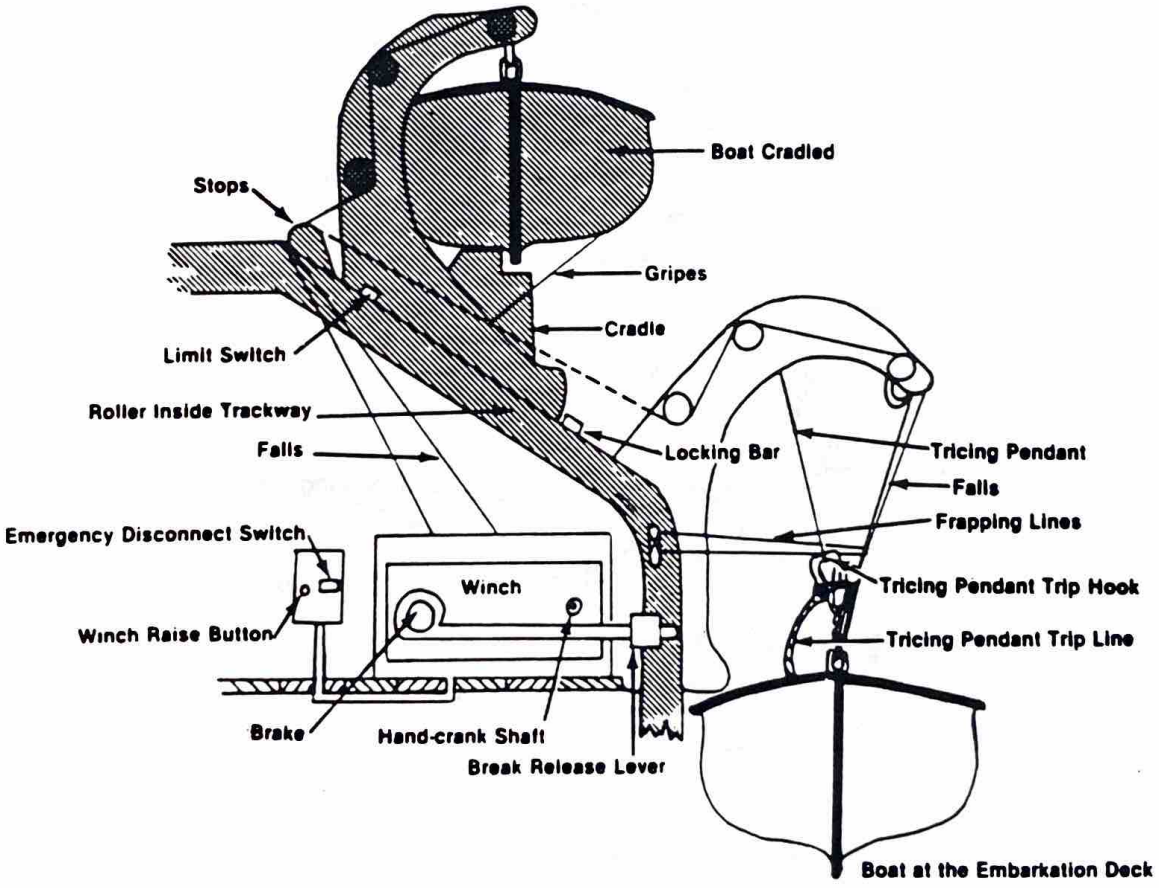
Roller gravity davit arms roll down fixed trackways to the outboard position on rollers. (See Figure 2-41.)

The **roller gravity davit** has two **belly gripes**, one at each end of the lifeboat. When tightened by **turnbuckles**, the gripes hold the lifeboat firmly in the **cradle**.

Gripes are secured to and released by a **trip hook** which is attached to the **locking bar**. The locking bar is a heavy metal bar across the trackway. If the brake fails while the gripes are secured, the locking bar would prevent the davit arms from rolling down the trackway. When the gripes are released, the locking bars slide clear of the trackways.

Winches on gravity davits have the following three operating controls:

1. An **off/raise** button.
2. An emergency disconnect switch.
3. Two limit switches, one for contacting each davit arm.



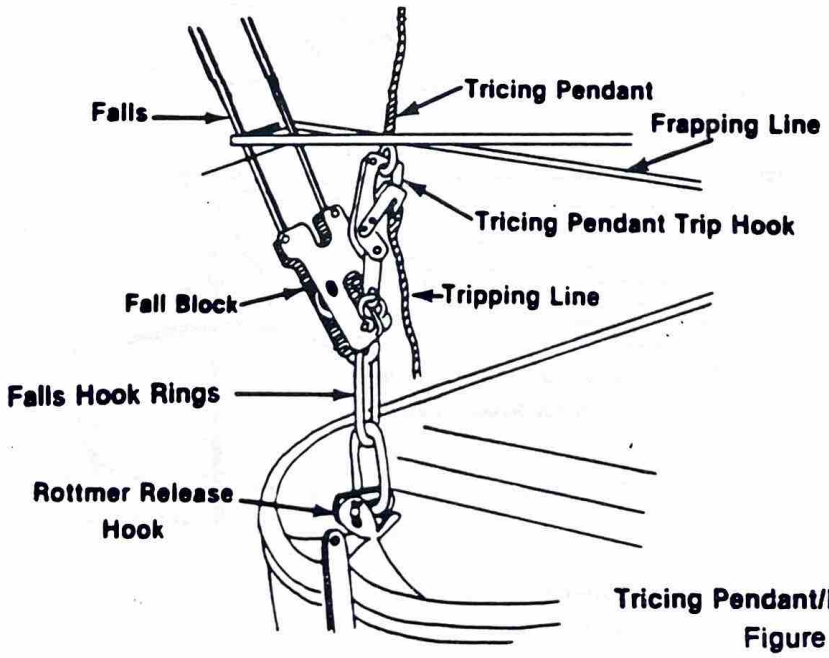
Roller Gravity
Figure 2-41

The motor for the winch is powerful enough to part (break) the wire rope falls if the motor is allowed to pull the davit against the **stops**. To prevent this, a **limit switch** is installed at the top of each trackway. This switch should stop power to the winch motor when the davit arm trips the switch **twelve inches** from the stops. The davit arms are then hand cranked to the final stowed position. The gripe tenders should trip the limit switch by hand each time the boat is raised. This will ensure the limit switches are working properly before the davit arms reach the top of the trackway.

Another safety switch is the **emergency disconnect switch.** If releasing the winch **raise** button does not stop the winch, the winch operator can turn the emergency disconnect switch **off** to stop the winch motor. This switch should always be in the **off** position when the handcrank is placed on the crank shaft.

The ship's master will ensure that the limit and emergency disconnect switches are inspected at least **every three months**.

Tricing pendants are wires attached to each davit arm and fall block. Tricing pendants pull the boat into the ship's side at the **embarkation deck** as the boat is being lowered. The brake should be put on before the tricing pendants take all the weight of the boat. If the brake is not put on, the falls would go slack. A strain may be placed on the tricing pendants when the boat is fully loaded. The **frapping lines** are next passed around the **falls** and secured with figure 8 turns to the **davit arm cleat.** Passengers and equipment can then be loaded aboard the boat. After all passengers and crew are seated, the tricing pendants must be released before the lifeboat can be lowered further. The frapping lines are now used to steady the boat's swinging while lowering or hoisting between the embarkation deck and the water.



Tricing Pendant/Frapping Lines
Figure 2-42

R. Launching a Lifeboat from a Roller Gravity Davit

Crew Of Nine Launching A Lifeboat From A Roller Gravity Davit

Nine persons can efficiently lower the roller gravity davit. The crew assignments are:

- Coxswain
- Winch/brake operator
- Gripe tenders (two persons)
- Frapping line tenders (two persons)
- Sea painter tender
- Bow person
- Stern person

Commands For Launching The Lifeboat

1. Man the davit:	Each person goes to his/her assigned location. Bow and stern persons take their place in the lifeboat. The boat cover and ridgepole support are removed. **The drain cap is screwed on.** The sea painter is tossed to the sea painter tender who leads it forward and secures it. The rudder and tiller are shipped and manropes are hung over the inboard side of the lifeboat.
2. Release the gripes:	Gripe tenders release the gripes and remove them from the lifeboat.
3. One whistle:	Winch/brake operator raises the brake release lever to lower the boat. Be careful to lower slowly as rollers reach the bottom of the track and tricing pendants become tight.
4. Two whistles:	Winch/brake operator stops lowering the boat at embarkation deck before the tricing pendants take all the weight of the boat.
5. Pass the frapping lines:	Frapping line tenders pass the frapping lines around the falls and back between the tricing pendants and the falls. They are then secured around a cleat with figure 8 turns. (Engine may be started.)
6. Embark the outboard side:	Passengers embark (get on) the lifeboat, move to the outboard side, and sit down.

7. Embark the inboard side: Passengers embark the lifeboat to the inboard side and sit down. (Children and ill passengers should be placed in the center of the lifeboat clear of wind and spray.) Passengers should be seated, so they do not interfere with the crew until the boat is clear of danger.

8. Standby the tricing pendants: Bow and stern persons unwrap the tripping lines from around the tricing pendant trip hooks.

9. Release forward tricing pendant: Bow person pulls the tripping line which releases the tricing pendant trip hook and frees the tricing pendant in the bow.

10. Release after tricing pendant: Stern person repeats the above step (step nine) in the stern.

11. Ease the frapping lines: Frapping line tenders release the tension on the frapping lines.

12. One whistle: Winch/brake operator raises the brake lever to lower the boat.

13. Two whistles: Winch/brake operator stops lowering the boat when the keel touches the water.

The coxswain gives the order to release the boat. The lifeboat is released on the crest of the highest wave or swell. This allows time for the frapping line tenders to pull the fall blocks in against the ship's side while the boat goes down into the next wave trough. This prevents the fall blocks from injuring the lifeboat passengers.

Remaining passengers and crew climb down the Jacob's ladder into the boat. The coxswain works the lifeboat away from the ship's side at about a 45° angle. The sea painter is released and the lifeboat gets under way using its primary propulsion source.

Crew Of One Launching A Lifeboat From A Roller Gravity Davit

You may find yourself on a sinking ship with no one to help you lower the gravity davit boat to the water. You can put the boat in the water by yourself in about 5 to 10 minutes.
Follow these steps:

1. If you have time, get rations and equipment.

2. Roll up the boat cover. Leave it in the boat.

3. Place the rations and equipment in the boat.

4. Throw the cover's ridge pole and ribs out of the boat.

5. Put the cap on the boat drain.

6. If you have time, start the engine.

7. Ship (install) the rudder and tiller.

8. Unhook the tricing pendants. Make sure they hang out of the boat, so they won't foul (tangle).

9. Hang all manropes over the **inboard side** of the boat. This will stop them from fouling in the boat. This also puts them where you can easily climb down them if you need to.

10. Release the gripes.

11. Lower the davit with the brake release. Stop lowering when the boat is a few inches above the crest of the waves.

12. Climb down a Jacob's ladder or manrope into the boat.

13. Release the Rottmer release lever while the boat is on the crest of a wave.

14. Shove the bow away from the ship with a boat hook or oar.

15. Put the engine gear in **forward** and drive away.

16. Look for other survivors and follow the survival rules.

S. Retrieving the Lifeboat

Picking up a boat at sea can present as many problems as launching it.

The ship will position itself so the empty davit is on the lee side. The lifeboat must **go forward** of **the davit** to receive the sea painter. After the sea painter is made fast, the boat's propeller is stopped (or the oars are shipped). The coxswain then steers the boat under the falls. The **forward falls** are hooked on first. (If the after falls were hooked first and the sea painter parted before the forward falls were hooked, the lifeboat would turn end-for-end.) The boat is then hoisted clear of the water. The passengers can disembark at the embarkation deck, and the boat can be hoisted to the final stowed position.

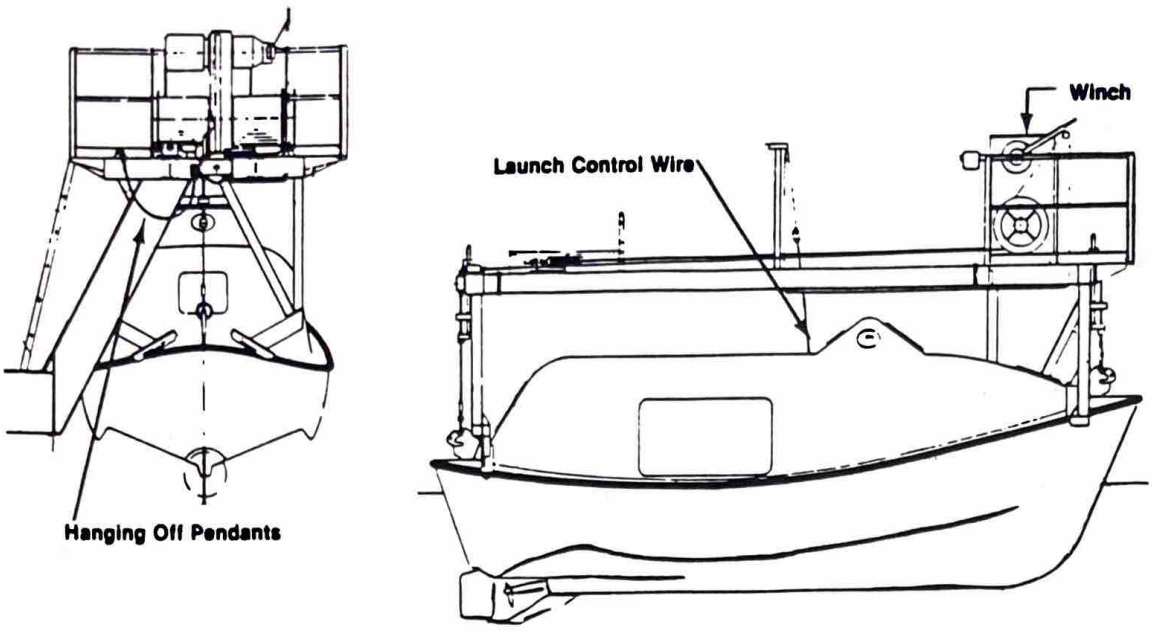
1.	Raise the boat:	Winch/brake operator moves to the winch raise button and pushes it.
2.	Two whistles Secure tricing pendants:	Winch/brake operator releases the winch raise button. The bow and stern persons reconnect the tricing pendants and rewrap the tripping line around the tricing pendant trip hooks with two round turns and a half hitch.
3.	One whistle:	Boat is lowered to the embarkation deck.
4.	Two whistles:	Lifeboat is halted at the embarkation deck.
5.	Disembark inboard side:	Passengers on the inboard side of the lifeboat disembark.
6.	Disembark outboard side:	Passengers on the outboard side of the lifeboat disembark.
7.	Take in frapping lines:	Frapping line tenders release the frapping lines from the cleats and from around the falls.
8.	Raise the boat:	Winch/brake operator again pushes the winch raise button to raise the boat.
9.	Two whistles Secure power and hand crank:	The lifeboat will trip the limit switch, and the winch/brake operator then secures power to the emergency disconnect switch and hand cranks. As the boat is being hand cranked, the sea painter is taken in and stowed, and the boat plug is removed.
10.	Two whistles Secure from hand cranking and pass the gripes:	When the lifeboat davit arm pin reaches the dove tail, the winch/brake operator stops hand cranking and stows the hand crank lever. Gripe tenders then pass the gripes to the bow and stern persons. They bring them over and around the lifeboat and back to the gripe tenders to secure with two round turns and a half hitch.
11.	Three whistles:	Dismissal from lifeboat drill.

T. Oil Rig Platform Davits

Davits aboard oil rig platforms are different from ship davits - the boat remains hanging over the water in the stowed position.

If possible, the lee lifeboat should be used so the boat will drift away from the oil rig platform. If the boat is launched on the windward side, the boat must be turned and driven away from the rig platform as rapidly as possible to avoid drifting into the rig.

Smoke from a burning oil rig platform may reduce visibility to zero. Therefore, the compass course used to steer the boat away from the oil rig platform should be clearly marked near the compass in each boat.



End-on and Side View of Oil Rig Platform Davit
Figure 2-43

Launching Procedure

1. Release the two boat gripes, if provided. (The boats of some drill rigs that are high above the water do not have gripes.)

2. All persons embark. The boat is lowered from inside once the boat gripes are released.

3. Close all doors, hatches and rowing ports.

4. Fasten seat belts.

5. Start the engine. This may be done while step six is being done.

6. The coxswain lowers the boat to the water by pulling the **winch remote control wire.** It is near the coxswain's head. Tension must be kept on the control wire until the boat is in the water.

7. When the boat is in the water, release the winch remote control wire. The coxswain removes the **safety pin**. The coxswain then throws the **releasing gear operating lever** which releases both fore and aft releasing hooks.

8. Turn the boat away from the oil rig platform and head away on a predetermined compass course. If the boat is operating in an oil fire or highly poisonous atmosphere, the boat's water spray and air supply systems should be used. See the section on **Enclosed Lifeboats** for a general description of this survival system.

Recovery Procedure

1. Operator on deck pays out additional falls as necessary to reach the boat's releasing hooks. Coxswain resets release gear and instructs crew to check hooks to be sure they are fully locked in place. The **safety pin should not be inserted yet**, since emergency release may be necessary if hoisting starts with only one fall wire hooked.

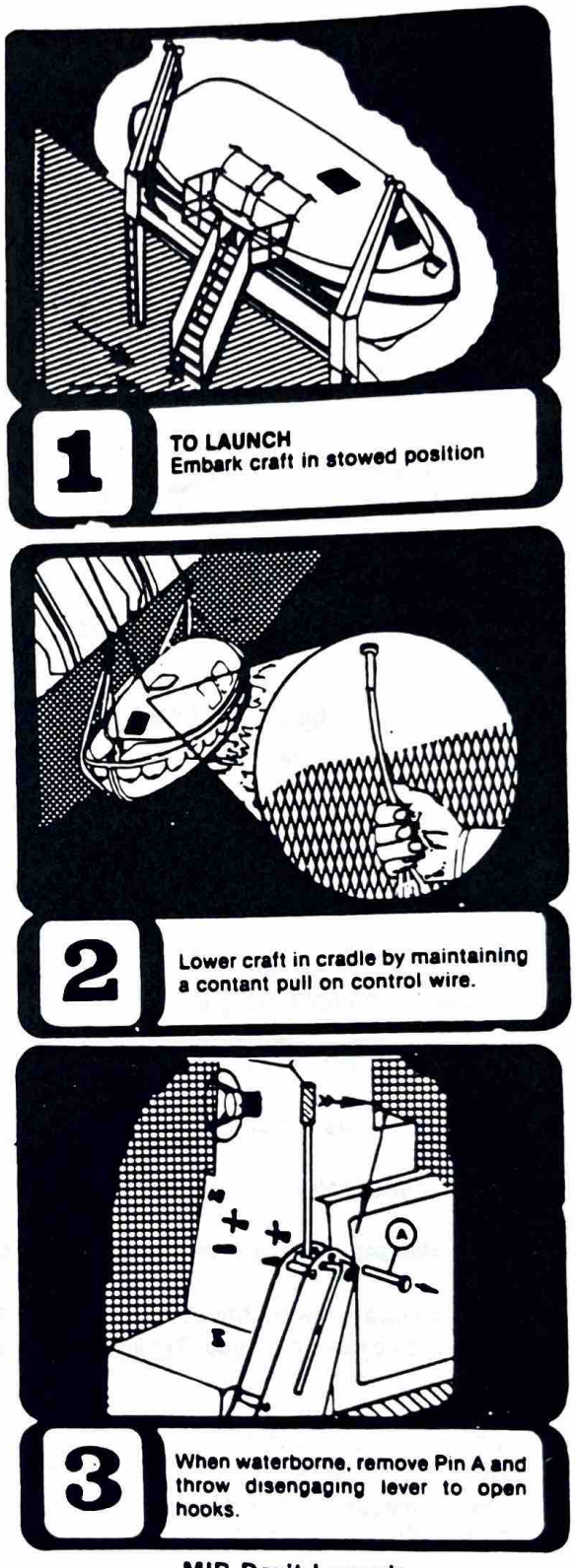
2. Crewmen, operating through open hatches at each end, hook the **fall rings** into the **hooks**.

3. Deck operator ensures the **brake lever** and main **disconnect switches** are on. Deck operator then pushes the **hoist button** and holds it while watching the boat. Once clear of the water, the coxswain replaces the **release lever safety pin**.

4. Deck operator must be ready to stop hoisting if the **limit switch** does not work.

5. When the limit switch stops the **winch motor**, the boat's occupants disembark. The davit is then hand cranked until the davit bumpers come against the boat's deck. This can be determined by rocking the boat it will stop rocking when the bumpers are engaged. Stow the **crank handle**.

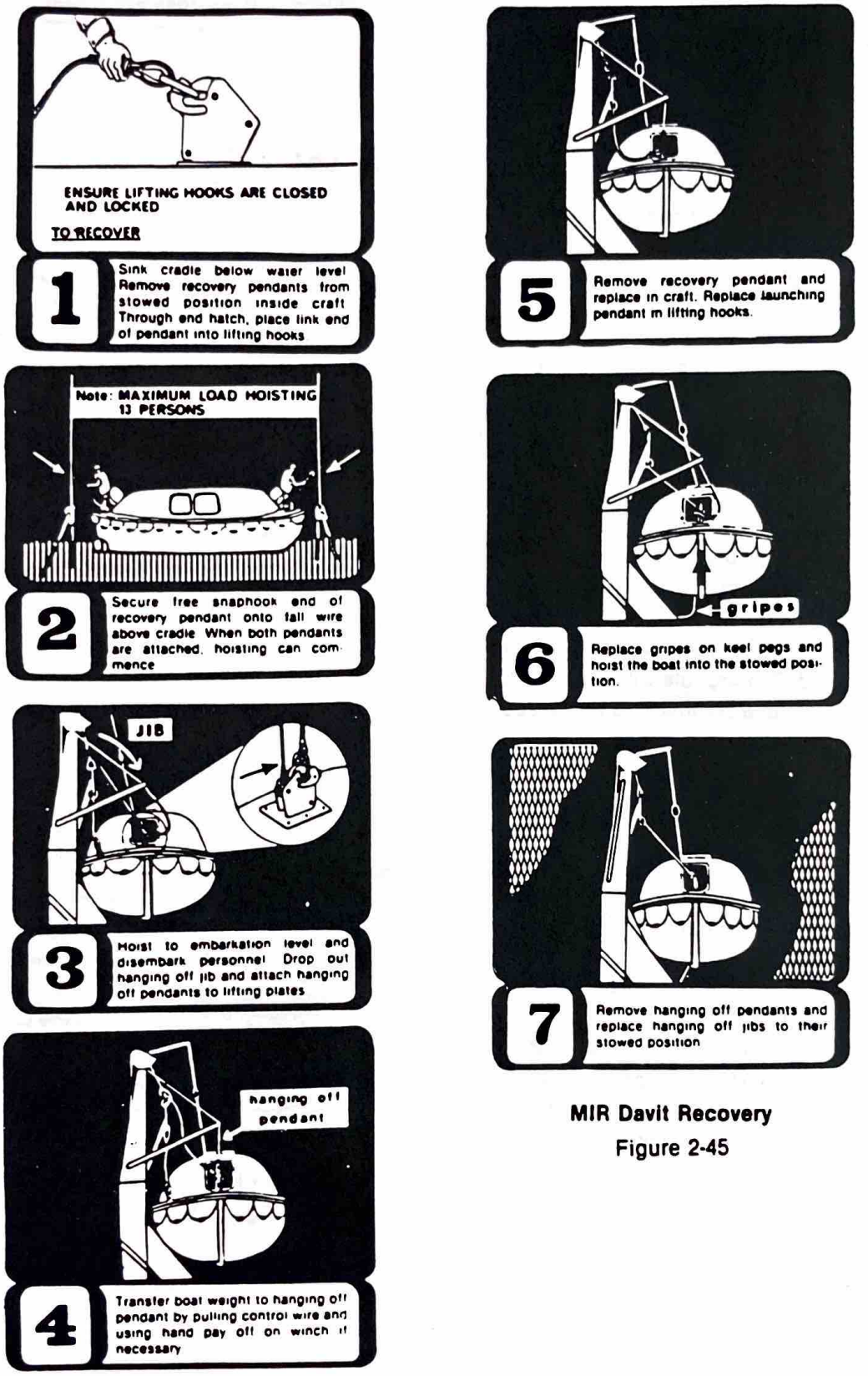
6. Pass the remote contol wire through the fitting in the boat's top. Check to see that the control wire is wrapped evenly on the control drum. Leave the boat so it is ready to get underway in an emergency.



MIR Davit Launch
Figure 2-44

The launching procedure is done from inside the boat. The gripes are released automatically as the lifeboat is lowered by the launch control wire. (See Figure 2-44.)

The recovery procedure is more involved. No more than 13 persons should be hoisted. Other persons should climb a ladder. (See Figure 2-45.)



MIR Davit Recovery

Figure 2-45

U. Survival Capsule Davits

Launching Procedure

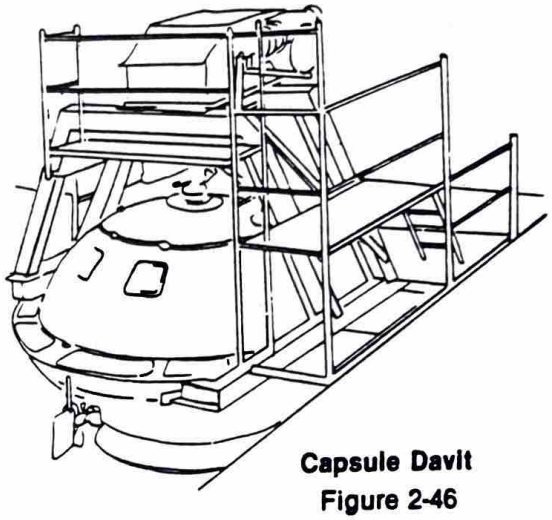
1. Board the capsule. Fill the lower seats first. The occupants should be evenly distributed because only one fall wire is used. Close all doors, hatch covers and vents. Fasten seat belts.

2. Start the engine. This may be done while step three is being done.

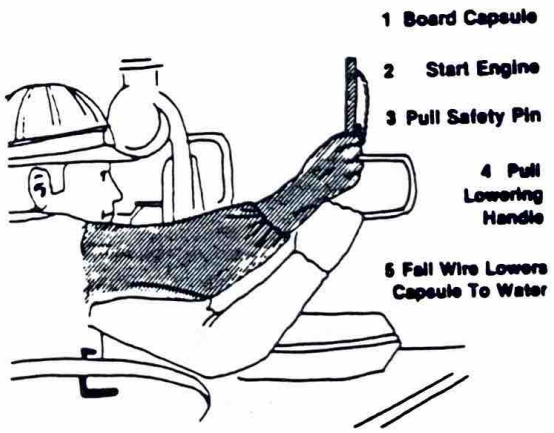
3. Prepare for lowering. Upon command of the person-in-charge, the hook man opens the center hatch cover and reaches up to remove the safety pin from the lowering handle (See Figure 2-47.) He then pulls the launch handle and *lets it go.* Hatch covers are then closed. The capsule will lower on its fall wire at a controlled rate of speed.

4. When the capsule is in the water, the person-in-charge: (1) removes the safety pin from the release lever found inside the capsule under the top; and then (2) pulls the release lever to unhook the wire fall from the capsule.

5. Turn the capsule away from the oil rig platform and head away on a predetermined compass course. If the capsule is operated in a fire or smoke contaminated atmosphere, the water spray and air supply systems should be used when necessary.



Capsule Davit
Figure 2-46



Lowering Capsule
Figure 2-47

Recovery Procedures

1. Inside the capsule, the person-in-charge resets the release hook by: (1) pulling on the lever to close the hook and (2) inserting the safety pin of the lever to lock the release hook.

2. The winch man adjusts the fall wire to correct length. He then resets the winch launch mechanism by following the posted instructions.

3. When the capsule is properly positioned under the fall wire, the hook-up man in the center hatchway reaches up, grabs the lifting ring and shoves it into the release hook.

4. The winch man pushes the winch start lever and raises the capsule. He must stop raising about six feet from the boarding deck. The capsule crew turns the capsule as necessary with the hooks and lines secured to the platform. When the capsule is in the right position, the capsule is raised until the limit switch stops the winch just before the capsule reaches the final stowed position. If the capsule's steel flange bearing plates are in line with the main beams of the platforms, the winch operator hand cranks the capsule to its final stowed position.

5. The crew disembarks the capsule. The safety pin (shown in Figure 2-47) is reinserted in the lowering handle, and the capsule is restored in ready-to-launch condition.

V. Navigating by Compass

The safe navigation of your lifeboat can depend upon the **compass.**

There are two main types of compasses:

1. The **magnetic compass** - It uses the earth's magnetic field.

2. The **gyro compass** - It uses electricity to run and works on the gyroscopic principle of the spinning wheel.

Only the magnetic compass is found on lifeboats.

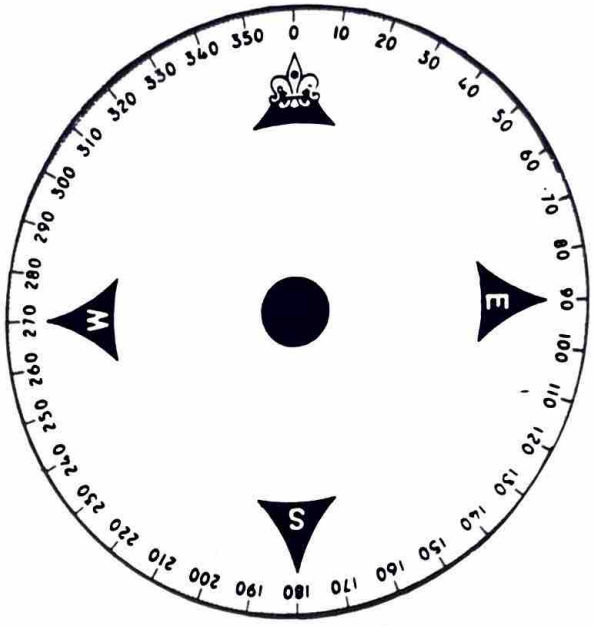
Understanding Compass Characteristics

Magnets which are free to turn line themselves up with the earth's magnetic field.

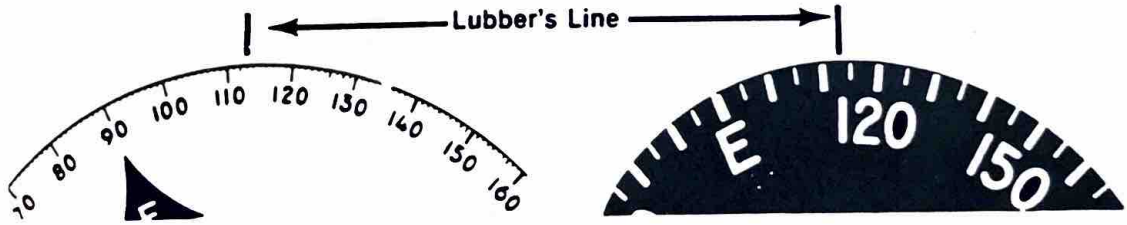
Magnets are fastened to a round card. The card is marked in 360 degrees. North (000°), east (090°), south (180°), and west (270°) are also marked on the compass. (See figure 2-48.)

This card is supported on a pivot. No matter how the boat swings, the card remains lined up with the magnetic North Pole.

In the window of the compass or marked on the compass bowl, is a line called the **lubber's line.** (See Figure 2-49.) It must be lined up with the exact **centerline** (fore and aft line) of the boat. This is usually done by slipping the compass into a permanent bracket. The compass is placed where the coxswain can see it. By noting the compass card direction that is lined up with the lubber's line, the coxswain can tell the direction in which the boat is heading.



Magnetic Compass Card
Figure 2-48



Marked in Degrees
Course is 113°

Marked Every 5°
What is the Course?

Reading a Compass with Lubber's Line
Figure 2-49

Most of the time, the magnetic compass does not point directly north. Usually there is a difference of several degrees. This difference is known as **compass error.** Compass error is made up of **variation** and **deviation.**

VARIATION - **Compass variation** is caused by the difference in location between the Magnetic North Pole and the True North Pole. The magnetic variation of the earth varies from place to place. Every nautical chart shows the variation for that area.

DEVIATION - **Compass deviation** is caused by the presence of metal objects near the compass. It could be the iron or steel in the boat, the engine and other equipment. A knife in the pocket of someone near the compass or shoes with steel in them can cause deviation. **Never bring a metal object near a compass that is being used.**

Some compass cases have instructions telling how to adjust for compass error. There are small magnets inside the cases to take out some of the compass error. You adjust these by turning screws mounted on the outside of the compass case.

When you steer a boat by compass, it looks like the compass card is moving around. It is not. It is the boat and lubber's line which are moving around the card. The magnets under the compass card remain pointing toward the Magnetic North Pole.

W. Finding and Navigating by the North Star

When steering a lifeboat or liferaft without a compass on a clear night, you could use the **North Star** (Polaris) to guide you. The North Star is almost directly over the North Pole.

To find the North Star, follow these steps:

1. Look for a constellation (group of stars that forms a picture) called the **Big Dipper.** It looks like its name - a large ladle outlined by seven stars. (See Figure 2-50A.)

2. Find the two bright stars (Dubhe and Merak) that form the front side of the Big Dipper's bowl. These are the pointer stars; they point to the North Star. (See figure 2-50B.)

3. Draw a straight line northward through the pointer stars; this line will connect with the North Star. It is the next brightest star in the line after the two pointer stars. (See figure 2-50C.)

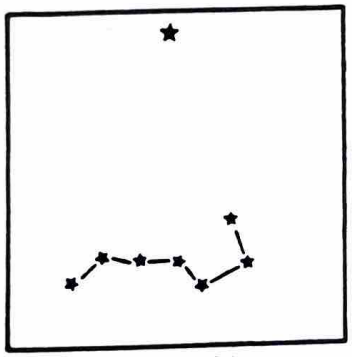


Figure 2-50A

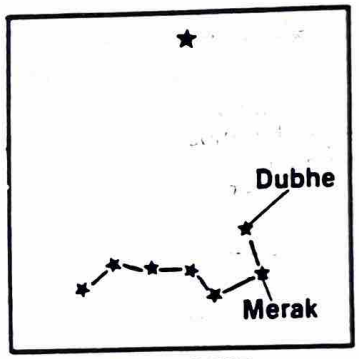


Figure 2-50B

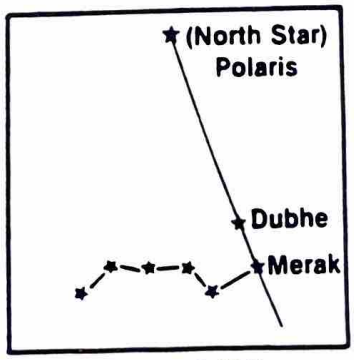
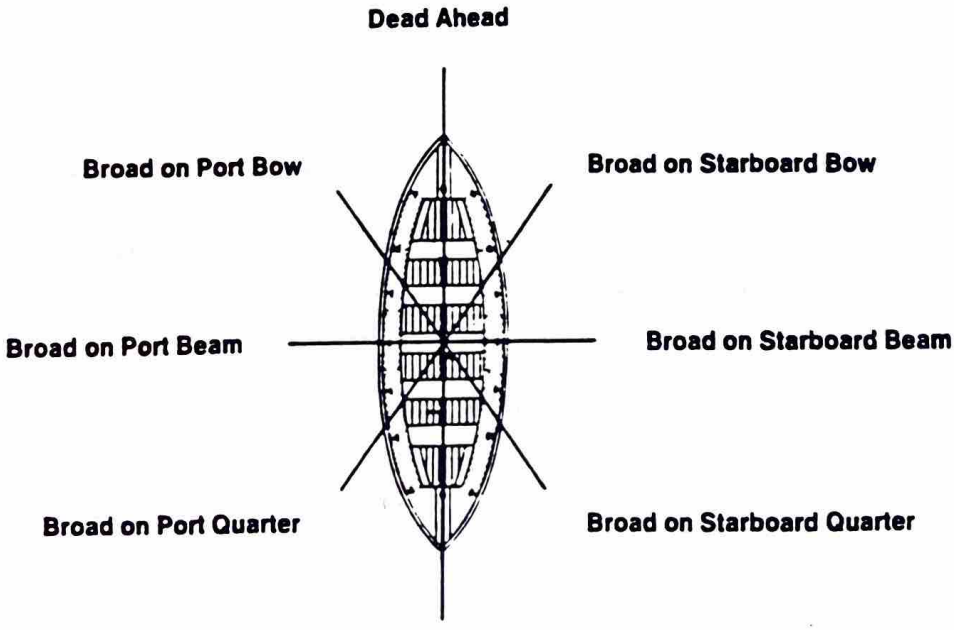


Figure 2-50C

The Big Dipper and North Star
Figure 2-50 A, B, C

To navigate using the North Star (see figure 2-51), put the North Star:

1. Dead ahead for a heading of north.
2. On the port bow for a heading of northeast.
3. On the port beam for a heading of east.
4. On the port quarter for a heading of southeast.
5. Astern for a heading of south.
6. On the starboard quarter for a heading of southwest.
7. On the starboard beam for a heading of west.
8. On the starboard bow for a heading of northwest.



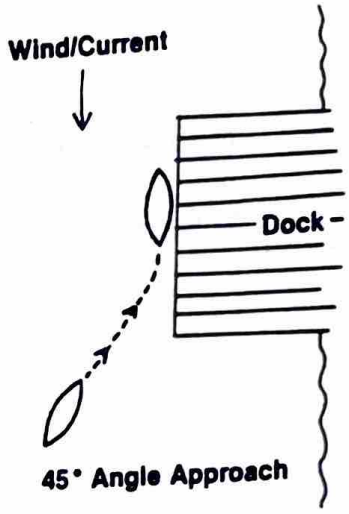
North Star Navigation
Figure 2-51

X. Other Uses of Lifeboats

Besides being used for abandoning ship, lifeboats may also be used to transport personnel or equipment to and from the ship. If the boat is used in a harbor, it is required by Rules of the Road to have navigation lights and a sound signalling device.

When mooring the lifeboat, head in against the wind and the current, if possible. You can maneuver the boat more easily with the wind or current from ahead. It is best to approach the dock at a 45° angle.

If the lifeboat is used to approach a seaplane, remember that the seaplane has very thin plating. Great caution must be used so the boat does not damage the seaplane. Soft fenders should be used. If a rubber raft is available, use it instead of a lifeboat.



Dock Approach
Figure 2-52

Chapter 3
USING INFLATABLE LIFERAFTS

A. Inflatable Liferafts

The inflatable liferaft is as important a lifesaving device as the lifeboat. Shipboard drills with the inflatable liferaft **are not** conducted because the raft container is sealed until ready for automatic or manual launching. Therefore, it is important to learn about the current design of rafts and keep abreast of future design progress. **Liferafts are inspected once a year.** The inspection must be done at a **Coast Guard approved service facility.**

Seamen should learn more about liferafts by visiting servicing facilities ashore where rafts are tested and repaired. At these facilities seamen can see inflated rafts and the equipment packed in the rafts.

B. Liferaft Size

Inflatable liferafts must be Coast Guard approved. Liferafts have a range of sizes. Ships that **do not** make international voyages can have rafts that hold **4 to 25 people.** Liferafts found on ships **that make** international voyages can have rafts that hold **6 to 25 people.** The capacity (number of persons it will hold) of the liferaft is marked on the container and on the raft itself. The manufacturer's name is also shown on the container. An inflatable liferaft complete with case and equipment does not weigh more than **400 pounds.** Liferafts are inspected every twelve months by authorized service representatives or the manufacturer.

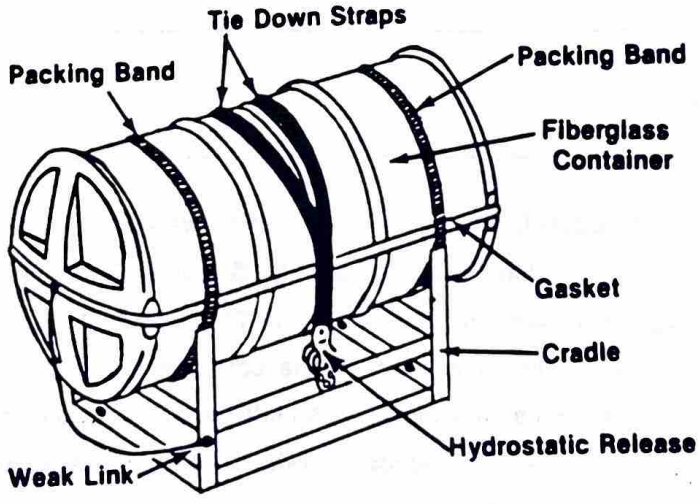
C. Liferaft Stowage

Liferafts are kept in a cradle on an open deck. This is done so they can float free if the ship sinks before you can manually launch the raft.

The liferaft container is strong, weather-tight and tamper proof. The raft container has small holes on the bottom for condensation drainage and air circulation. The container must be stowed with the words **THIS SIDE UP** on top to be sure the holes are on the bottom. Most containers are made of fiberglass.

The raft container is usually held together with **packing bands** which break when the raft is inflated. A watertight **gasket** seals the two halves of the container together.

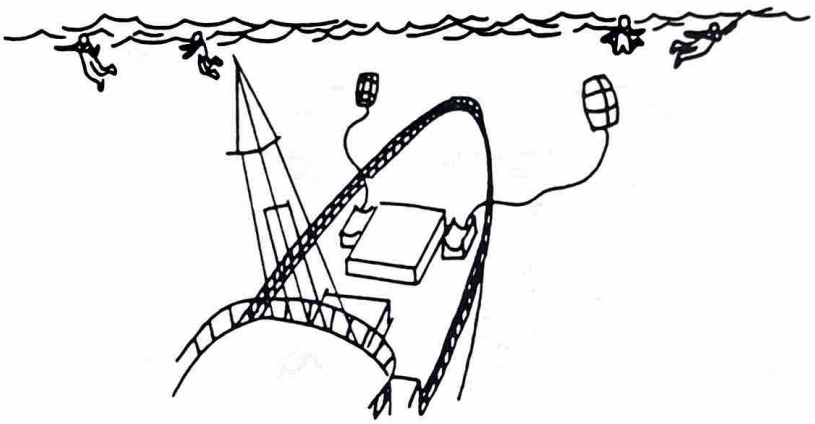
The container rests in a **cradle.** The cradle is permanently secured to the ship's deck. The container may be secured to the cradle with a **tie down strap.** The tie down strap has a securing device called a **hydrostatic release.** The **weak link painter-operating cord** is attached to the cradle.



Liferaft Container with Hydro. Release
Figure 3-1

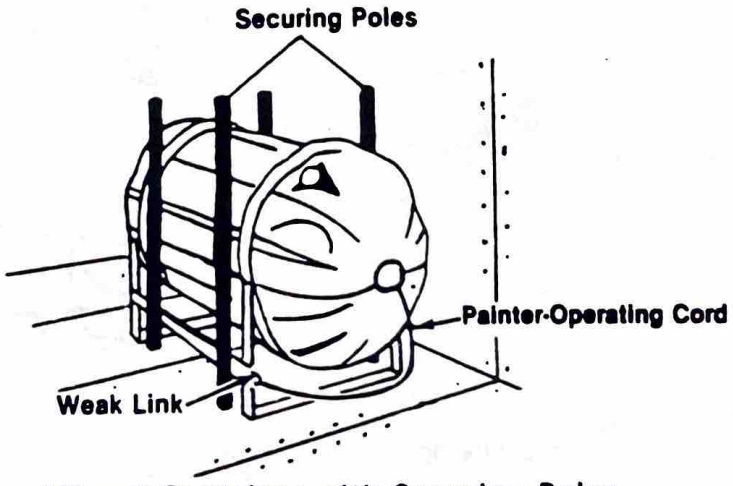
D. Automatic Launching

The hydrostatic release is triggered by water pressure. The ship must **sink ten to fifteen feet** deep before the hydrostatic release will be triggered. Then the container will float free toward the surface of the water. The 100 foot long **painter-operating cord** is attached by the **weak link** to a shackle on the cradle. The other end of the painter-operating cord is attached to the raft inflation tank and the raft's towing bridle. As the ship sinks below **100 feet**, most of the operating cord is pulled out of the container. It activates the raft's inflation system, and the raft will inflate. The buoyancy of the raft will cause the weak link to break allowing the raft to float free from the ship.



Liferafts Launched Automatically
Figure 3-2

Some liferaft containers may not use a tie down strap and hydrostatic release. Four securing poles may be used to allow the container to float free as the ship sinks below the water. (See Figure 3-3.)



Liferaft Container with Securing Poles
Figure 3-3

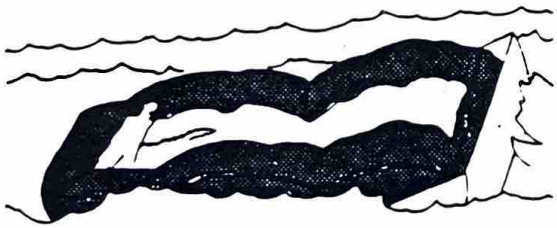
E. Manual Launching

To manually launch the raft, kick the hydrostatic release plunger or pull its lever outboard to release the tie down straps. Take the container to the lee side of the ship. **Tie the painter-operating cord to a strong part of the ship** and throw the entire container overboard. Sharply pull the cord out its full length (100 feet). This activates the raft's inflation system.

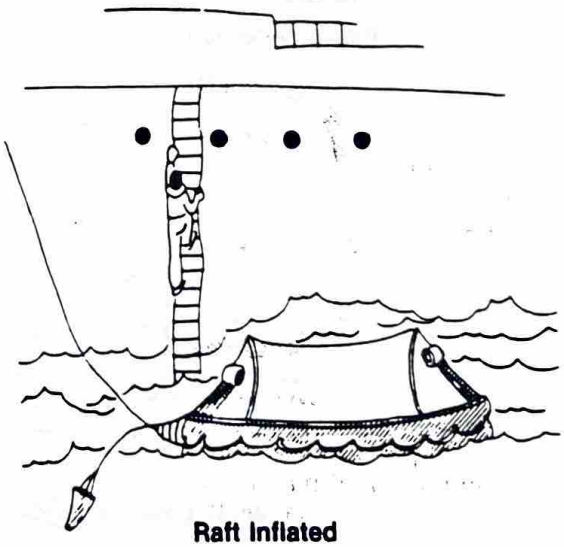
The cord also acts as a painter to hold the raft alongside the ship until it can be boarded. The raft can be boarded while it is partially inflated. The painter is cut from the raft after all persons have boarded.

Manual launch
Raft tossed oveboard; painter operating-cord secured to ship
Figure 3-4

Manual Launch
Painter-operating cord fully extended; sharp pull activates inflation system
Figure 3-5



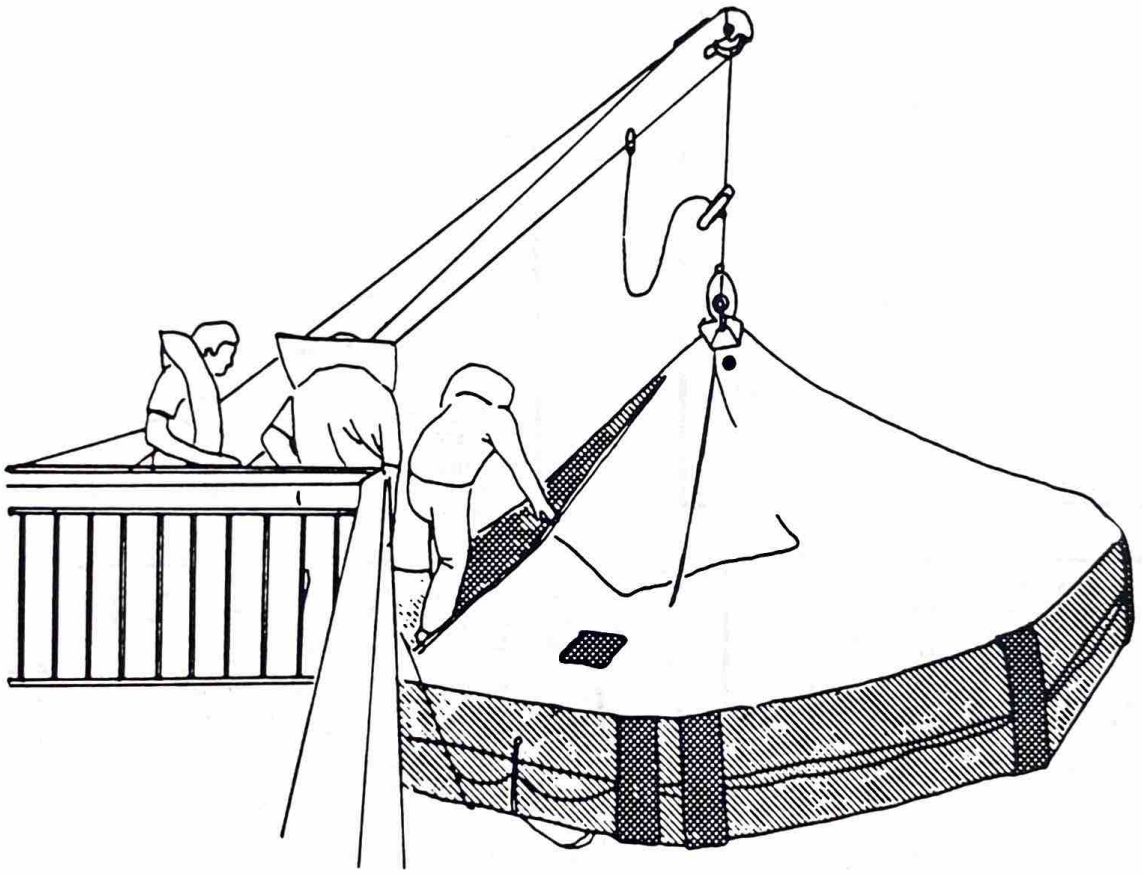
Raft Inflating
Packing bands have broken. Raft is inflating.
Figure 3-6



Raft Inflated
Painter operating cord secured to ship.
Sea anchor trailed automatically.
Raft ready to board.
Figure 3-7

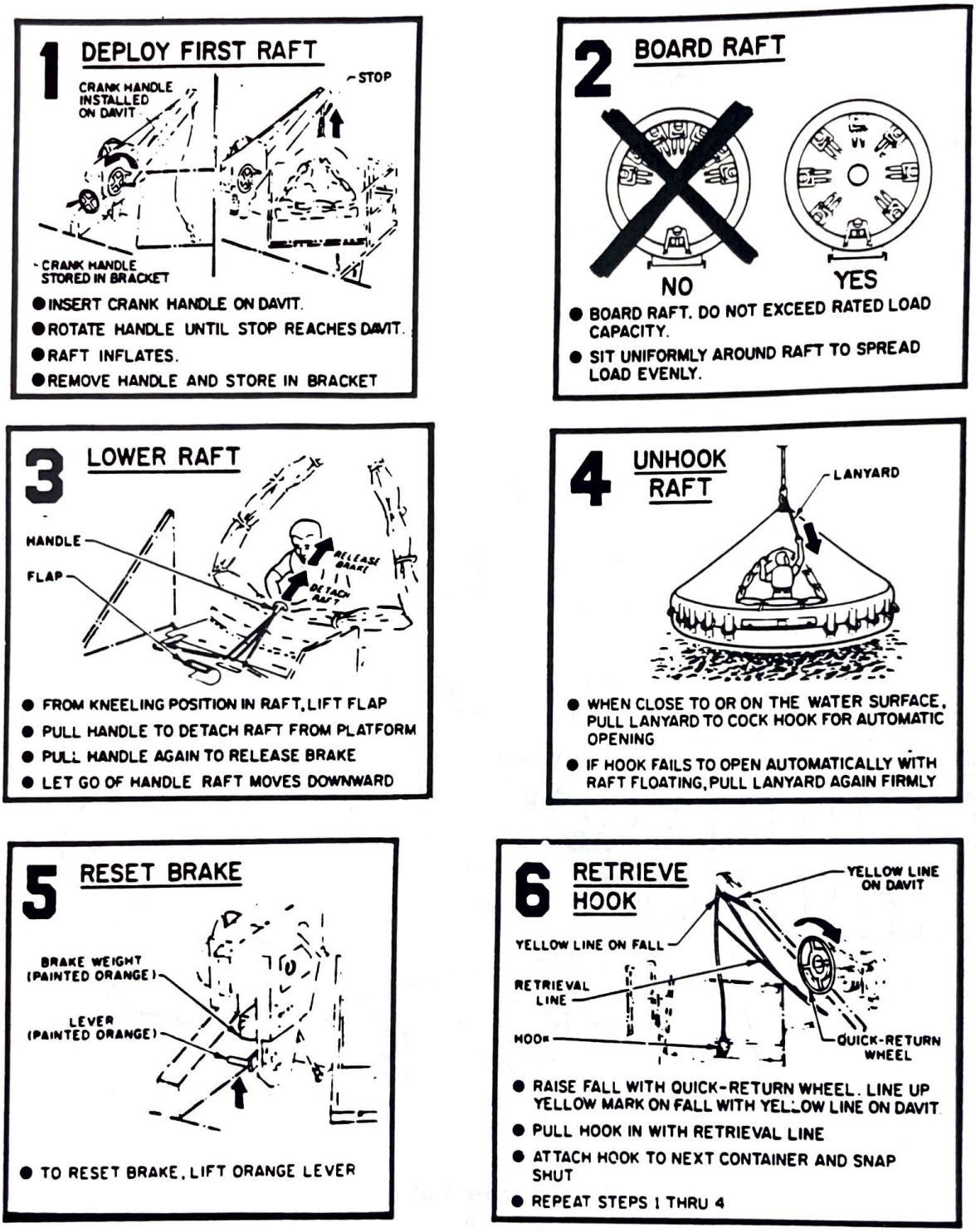
F. Davit Launching

Some inflatable liferafts are davit launched from the ship's deck. The passengers and crew can board from the deck and be lowered to the water. This makes it possible for the passengers to board the raft dry. Davit launched rafts are sturdier than ordinary rafts, so they will hold the raft's full load while suspended from a davit.



Davit Launched Raft
Figure 3-8

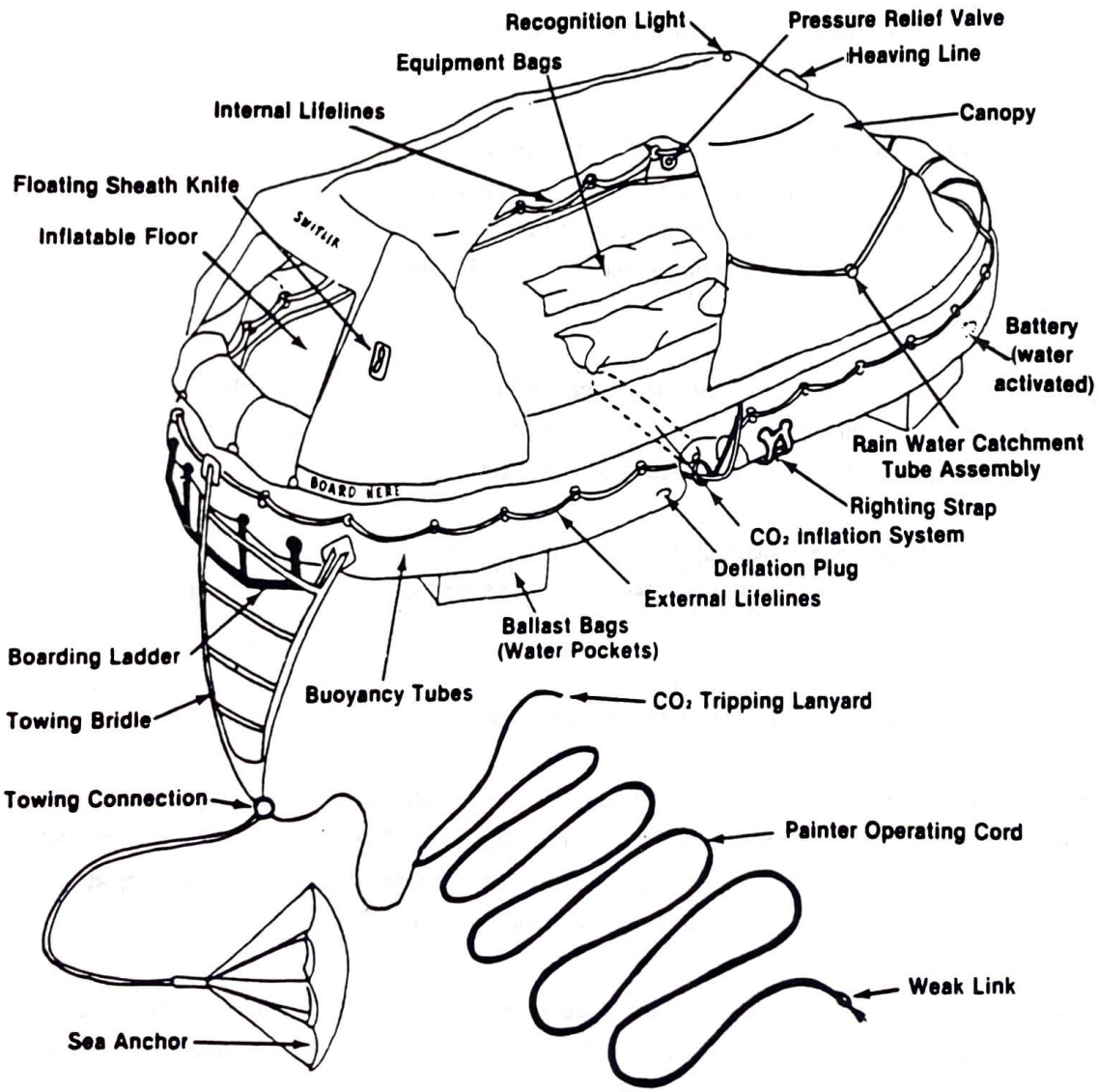
The following steps show how a typical raft davit system works. Be sure and check your ship's specific instructions. They may be different.



Davit Launch Procedure
(Sketches courtesy of B.F. Goodrich Co.)
Figure 3-9

G. Liferaft Design

Inflatable liferafts can be round, oval, octagonal (eight sided), or boat shaped. Specific design can vary among manufacturers.



Switlik Inflated Liferaft
Figure 3-10

Buoyancy tubes are located on the outer edge of the raft. They are made of thick, nylon-reinforced rubber. The buoyancy tubes make the raft float. They are divided into at least two compartments. The raft is made to support its rated number of persons even if half the compartments in the buoyancy tubes are deflated.

Carbon dioxide (CO_2) is usually used to inflate the raft. The **CO_2 cylinder** (container) is on the bottom of the raft. It is activated by a sharp tug on the 100 foot long painter-operating cord. The tug pulls the CO_2 tripping lanyard out of the CO_2 cylinder head which allows the CO_2 to enter the buoyancy tubes. However, CO_2 can escape through leaks in the tubes. The gas is odorless, tasteless, and colorless, so you must watch for leaks. If you breathe air with a large amount of CO_2, you can suffocate. **Always leave the curtains open if you know the tubes are leaking. Fix the leak as soon as possible.**

Pressure relief valves are installed in rafts. These valves are fitted in the tubes, so excess (extra) gas can automatically escape. It is normal for gas to escape right after the raft is inflated. You can tell it is escaping if there is a hissing sound coming from the valve. The sound will probably stop after a few minutes. The valves should be capped soon after inflation to stop loss of gas caused by waves moving against the tubes.

During the day, the rise in temperature might cause the gas to expand enough to activate the valves. At night, when the temperature drops, you might have to pump up the tubes with the inflation pumps because the air in the tubes might contract.

Sometimes, pressure relief valves do not work correctly. If gas continues to escape from the pressure relief valve, you can fix it with a safety valve plug from the repair kit. Then pump the tubes back up.

Deflation plugs are provided to deflate the raft after rescue.

The **floor** of the raft is also inflatable. The floor should be inflated with the inflating pump in cold climates. This will insulate the occupants from the cold sea water. The floor should be left deflated in warm climates. This will allow the cooler sea water to cool the inside of the raft. Some inflatable floors can be removed and used for an extra emergency float, if necessary.

A **boarding ladder** and **towing bridle** are fitted at each end of the raft. The two are usually combined. In addition to boarding and towing the raft, the raft can be hoisted aboard a ship by hooking onto one or both towing bridles.

Lifelines are provided inside and outside the raft. The interior lifelines are used by survivors to steady themselves. The exterior lifelines are used by survivors in the water.

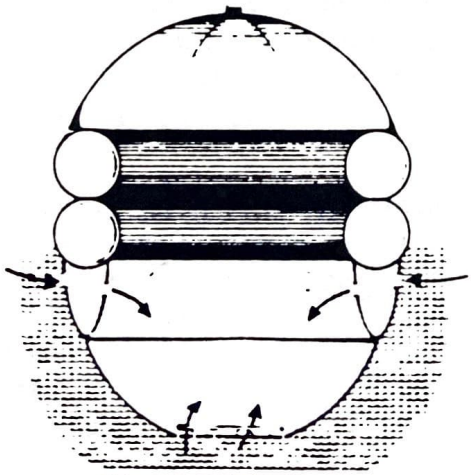
Two **lights** are installed on the canopy. These lights are automatically activated when the raft inflates. They are powered by either dry cells or water activated batteries. The lights can operate for at least twelve hours. The **external recognition light** can be seen from two miles away. The other light is inside the canopy. Putting out the lights in the day by unscrewing the bulbs or by the pull-apart plug does not extend the battery life. Removing the cells from the water and shaking the water out of them would prolong their use for hours of darkness if the cells could be reached under the raft.

The **canopy** has two layers to insulate the inside from extreme temperatures. The canopy erects (pops up) automatically as the arch tubes inflate. The canopy has tubes to collect rainwater. The canopy is colored Indian orange or some other bright color which would stand out on a whitecapped sea.

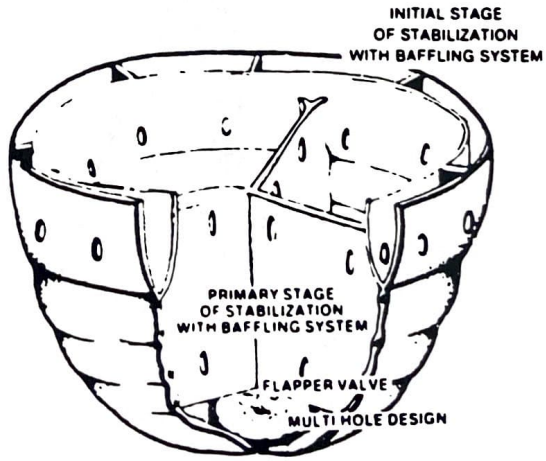
Ballast bags or **water pockets** are located under the floor. They have holes in them to allow sea water to fill them up when the raft is launched. Ballast bags have two purposes: (1) to slow the drifting of the raft and (2) to make the raft more stable and less likely to capsize.

The early rafts had four ballast bags, one at each corner of the raft. Some raft manufacturers now use improved stability pockets of larger size on the raft's underside. The Givens raft uses the large buoy bag shown in Figure 3-11. The continuous pocket around the raft keeps the edge of the bottom out of the force of the wind, and the large inlet check valve at the lower center lets the bag create drag against rapid movement like an in-water parachute. The buoy bag can be de-ballasted by pulling on a cord, so the raft can be paddled or towed.

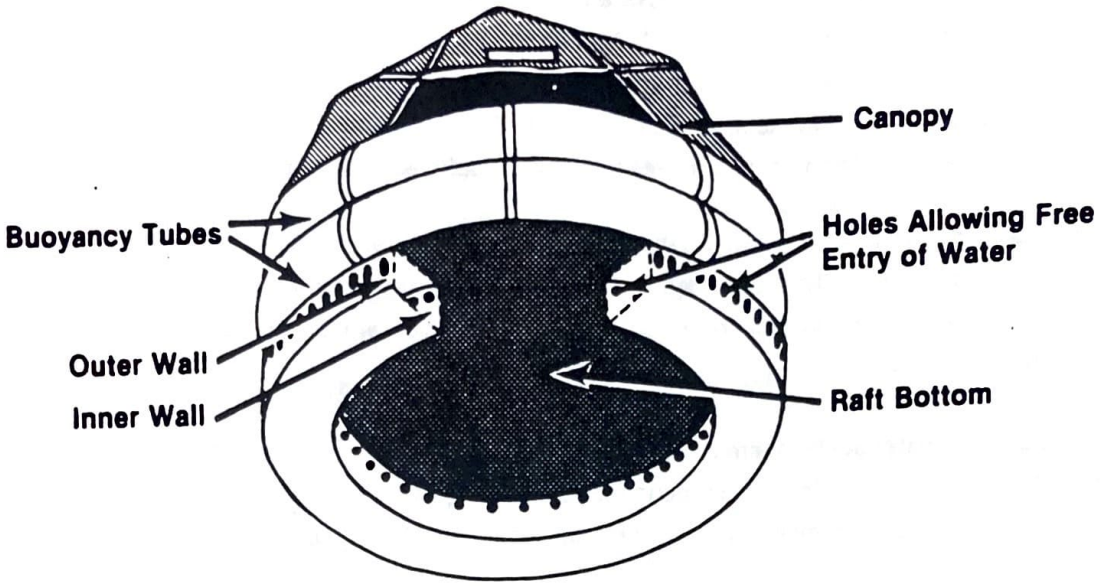
It is much harder to maneuver (handle) liferafts at sea than it is to maneuver lifeboats. Instead of oars, liferafts have only small paddles. Rafts are heavy and have a large sail area (their canopy) and a shallow draft. Without the drag created by their drogue and their ballast bags, a high wind might easily capsize them or drive them beyond the reach of a good swimmer. This is why you should tie their painter-operating cord to a secure place on the vessel before a manual launch.



Givens Raft Ballasted
Figure 3-11



Givens Raft Cutaway
Figure 3-12



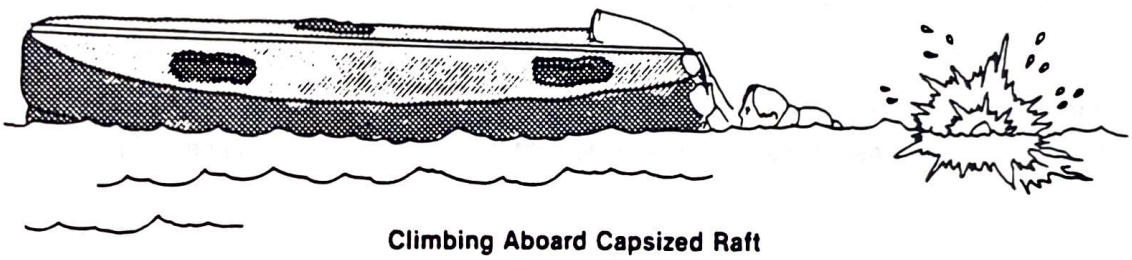
Toroidal Stability Device (TSD)
Figure 3-13

The Switlik stability system is described as a Toroidal Stability Device (TSD). The TSD is a double-skinned skirt hanging below the raft's buoyancy tubes. The space between the walls acts as a water holder. The outer wall has oval shaped holes in its upper part to let water enter. The inner wall has circular holes. The TSD rapidly fills with water when the raft is inflated in the water. To make it easier to tow the raft, the stability device flattens under water pressure.

H. Righting a Capsized Raft

A **righting strap** is fitted on the underside of the raft to right the raft (turn it right side up) if it capsizes or inflates upside down. The righting strap runs the full width of the raft. One person can easily right a capsized raft if it is righted **before** the canopy fills with water.

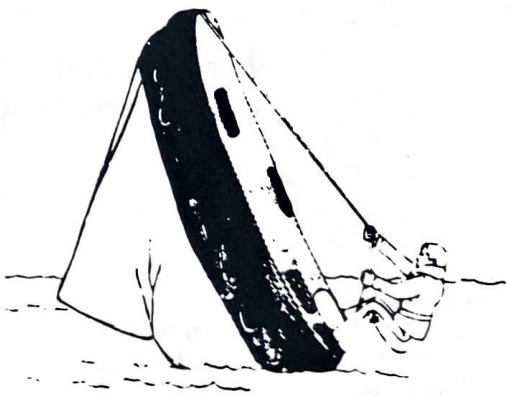
Swim to the side marked **Right Here.** If it is not marked, go to the side where the CO_2 cylinder is. Reach up and grab the righting strap. Start pulling yourself up onto the raft. It may help to kick your feet out as if swimming. If this doesn't work, try putting your feet or knees into the external lifelines to help you pull yourself up on the raft. Some rafts may right while you are climbing onto them. Others are more difficult to right.



Climbing Aboard Capsized Raft
Figure 3-14

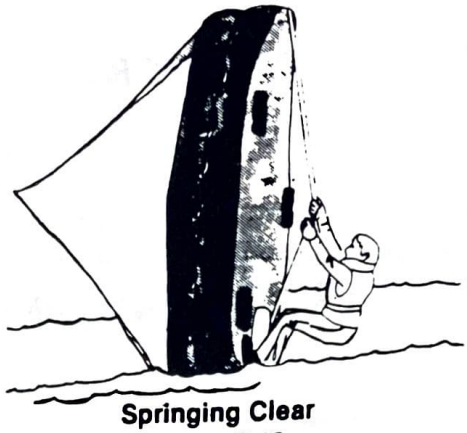
Stand on the very edge where the CO_2 cylinder is located. Lean back with all your weight while pulling on the righting strap with your hands.

If the canopy is empty, the raft will begin to follow you. If the raft is large, it will land on your head unless you bend your knees and spring backwards just as the raft begins to free fall. This should allow your head to clear the raft.



Standing on CO_2 Edge
Figure 3-15

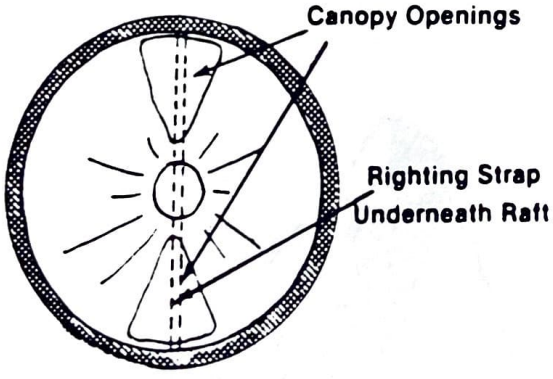
If the raft does land on top of you, do not panic. The bottom of the raft is soft and flexible. There will be an air pocket caused by your head pushing against the floor. You can catch a breath of air, and then use your arms to pull yourself out from under the raft **face up.** If you try to swim out face down, the raft may hang up on the back of your life preserver. If this happens, it will be difficult for you to get out from underneath the raft.



Springing Clear
Figure 3-16

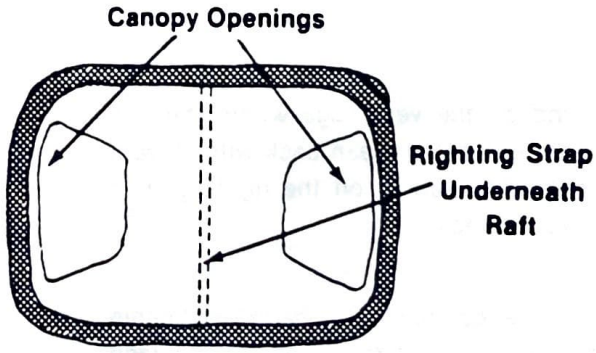
If the inverted canopy fills with sea water, the raft may be more difficult to right. Generally, round rafts have the righting strap parallel to the canopy openings. This allows the water to flow freely out of the raft while the raft is being righted. (See Figure 3-17.)

If the raft is oval with the righting strap at right angles to the canopy openings, water tends to stay trapped in the canopy. It may take several persons to right this type of raft. (See Figure 3-18.)



Overhead - Round raft
Righting strap is shown underneath raft parallel to the canopy openings. This type rights well even when filled with water.

Figure 3-17

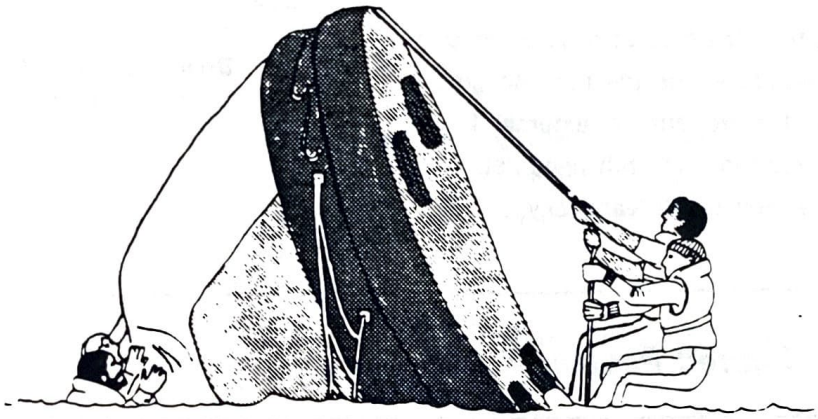


Overhead - Oval
Righting strap is shown underneath raft at right angles to the canopy openings. This raft is difficult to right when filled with water.

Figure 3-18

A single person might be able to right a water-logged raft. He can try by pulling and walking the righting strap through his hands until the opposite side is pulled over. This takes a lot of strength and can be very difficult to do.

If one person cannot right a capsized raft, the canopy probably has filled with sea water which cannot escape. Try two persons pulling on the righting strap. If this does not work, then get several persons in the water **on the opposite side of the raft.** These persons should work the water out of the canopy by pushing up on the canopy while two people pull on the righting strap.



Righting Raft filled with Water
Figure 3-19

I. Boarding the Liferaft

Liferafts may be boarded:

1) At the embarkation deck if a davit launched raft is used (See Figure 3-8.)

2) By climbing down a ladder,

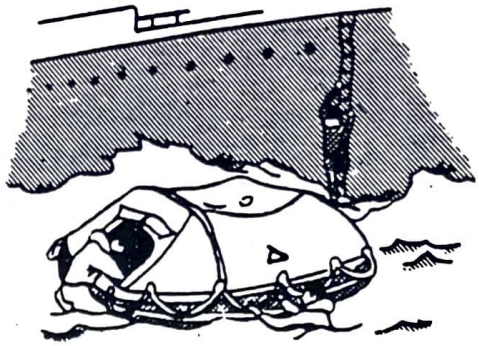
3) By jumping into the canopy entrance from the ship,

4) From the sea.

Jumping into Opening
Figure 3-20

Stay dry as posible when getting off a vessel. Sometimes this is possible by climbing down a ladder, net or line until you are **within four feet of the raft.** Then jump into the open canopy entrance. Land on the floor of the raft with the balls of your feet. (If you land with your heels first, you could fall backwards into the water.) Stretch out your arms and land with your chest against the inflated canopy arch. **Do not jump onto the roof of the raft!** People inside could be injured.

When boarding from the sea, place your feet on the boarding ladder. Reach inside the raft and grab the internal lifelines, if there are no external lifelines provided. Pull yourself into the raft headfirst. **Do not grab hold of the canopy.** It will tear easily.



Boarding from Sea
Figure 3-21

J. Assisting Injured People

Two people can help an injured person board an inflatable liferaft using these steps (See Figure 3-22):

1. Place their outboard knees on the top of the buoyancy tube.
2. Turn the injured man with his back toward them.
3. Grab the injured peron's life jacket with their **inboard** hands.
4. Grab the injured person's upper arms with their **outboard** hands.
5. Push the injured person slightly down into the water and use his buoyancy to help spring him up and over into the liferaft, **back first.**
6. The two rescuers fall to either side on the raft's floor. This allows the injured person to fall between them.

Assisting Injured
Figure 3-22

K. Liferaft Equipment

Inflatable liferafts are provided with the equipment necessary for **handling the liferaft, alerting rescuers,** and **surviving at sea.** The following list is for inflatable liferafts on ocean service ships. Ships on lakes, bays, sounds, and rivers have considerably less equipment.

Heaving Line

A buoyant heaving line that is **100 feet long** with a **buoyant quoit** (small floating ring) at one end is provided. The other end is attached to the raft near the aft entrance.

Instruction/Survival Manual

A booklet printed on water-resistant material should be hanging in a clear envelope from one of the canopy arch tubes. The manual describes how to use the raft's equipment. It also contains internationally recognized distress signals and survival information.

Instruction Card

A plastic card hangs from inside the canopy. The card shows immediate steps to be taken by survivors upon entering the raft.

Jackknife

One jackknife is provided on rafts holding up to twelve persons. The knife has a can opener. Two knives are required on larger rafts.

Floating Sheath Knife

It may be necessary to cut the painter or the drag line of the drogue to let the raft better escape a burning oil slick or a sinking ship. There is a floating sheath knife provided for this purpose. It is kept in a special pocket outside of the forward entrance to the raft.

Paddles

Two-four-foot-long paddles are included. If they are made of metal, they should be rigged as a radar reflector whenever they are not in use as paddles.

Inflation/De-watering Pump

A pump is provided so survivors can keep the raft inflated. The pump can also be used to pump water out of the raft. This is done by reversing the way the hose is attached.

Sea Anchors (Drogues)

Two sea anchors are provided. Each must be a minimum of **two feet** in diameter. One sea anchor is attached to the outside of the raft and streams automatically when the raft is inflated. The other one is a spare. Each sea anchor has fifty feet of nylon line attached. Drogues create a drag on the liferaft. **This could be dangerous in certain situations.** If you are in an emergency situation (such as

burning oil moving towards you), **cut the sea anchor.** This will allow your liferaft to move away more quickly. Remember, you have a spare.

Bailers

Two flexible bailers are provided on rafts carrying thirteen or more people. One bailer is carried on smaller rafts.

Caps

Caps or blank-off plugs are provided for closing the pressure relief valves once the raft is inflated. Figure 3-10 on page 50 shows these relief valves.

Sponges

Two cellulose sponges are provided.

First Aid Kit

A kit containing first aid supplies is provided.

Flashlight

A flashlight with three spare batteries (or one 3-cell spare) and two spare bulbs are provided. The flashlight is Coast Guard approved. It is waterproof and has a blinker button for signalling.

Signal Mirror and Whistle

A mirror and whistle for signalling rescue units are provided.

Red Rocket Parachute Flares

Two red rocket parachute flares are provided. They are approved for three years of service from the date of manufacture.

Hand-held Red Flares

Six hand-held red flares are provided. They are approved for three years of service.

Hand-held Combination Flares & Orange Smoke Distress Signals

Two hand-held combination flare and orange smoke distress signals are provided. The orange smoke is to be used in daylight only when a rescue vessel or plane is in sight. They are approved for three years of service.

Provisions

One pound of hard bread or its approved nutritional equivalent is provided for each person. The food is packed in sealed cans.

Water

One and one-half quarts of water is provided for each person. The water comes in sealed cans. The cans are approved for five years after packing. Some rafts may contain desalting kits, each containing eight tablets. Each tablet can be mixed with salt water to produce one pint of drinking water. Some rafts have plastic stills that use the heat of the sun to make one-third of the raft's required water. Each floating balloon-like still can make about two and one-half pints of the drinking water in twenty four hours.

Can Openers

Three can openers are provided.

Drinking Cup

A flexible drinking cup marked in ounces is provided.

Fishing Tackle Kit

A kit containing fishing tackle is provided.

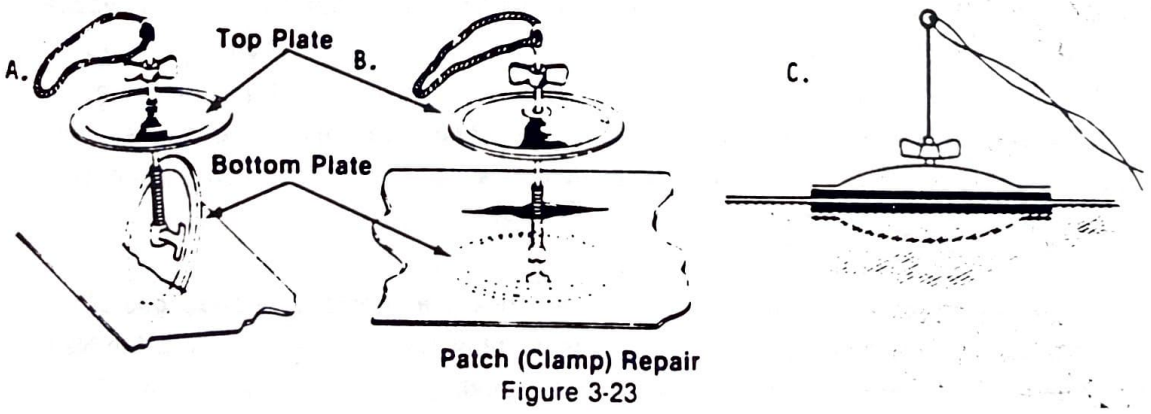
Anti-seasickness Tablets

Six anti-seasickness tablets are provided for each person.

Repair Kit

A repair kit for repairing the bouyancy tubes is provided. The repair kit contains a roughing tool, **five rubber tube patches** (two inch diameter) and cement. These are used for patching. Apply cement to both the tube patch and the area around the hole (the cement is flammable, so no smoking while making repairs). Be sure the tube patch is one inch larger than the hole. Allow both to dry, and apply a second coat of cement to both. When both are tacky, press the tube patch on the hole. Do not completely inflate the raft until the tube patch has had **twenty four hours** to dry.

Six sealing clamps (patches) are also included in the kit for plugging **large holes** and any hole are which **cannot be kept dry** enough to use cement. Loop the cord on the oval clamp around your wrist to prevent losing it. Dip the clamp into the water. This makes it slippery so it can be inserted easily. Push the bottom plate through the hole (Figure 3-23A). If the hole is too small, carefully enlarge with the floating sheath knife (or jacknife) so it is equal to the **width of the oval sealing clamp**. Then insert the clamp. Pull the bottom plate against the inner surface of the buoyancy tube and slide the top plate against the outer surface of the tube (Figure 3-23B). Adjust the oval clamp to completely cover the hole by turning plates lengthwise to the hole. Hold the clamp assembly in place and screw down the wing nut until it is tight (Figure 3-23C). Always use the smallest available size clamp first; you may later need the larger clamps to repair larger holes. (You can always make small holes big enough for large clamps, but not large holes smaller for small clamps.)



Patch (Clamp) Repair
Figure 3-23

Chapter 4
Understanding Survival Methods

A. Understanding Coast Guard Searches

In normal survival situations, it is best to stream the sea anchor and drift with the wind and current. A distress message telling your position was probably transmitted before the ship sank. Even if a distress message was not sent, the ship's agent will realize something is wrong if he does not receive the daily radio call from the ship. The agent will contact the Coast Guard. The Coast Guard will start searching for the ship. They will use the ship's last reported position and the ship's route to track you down. The Coast Guard will know the water currents and speed and direction of the wind in that area. They will shift their search according to that knowledge.

Any attempt by survivors to move out of the direction of the normal drift might end in disaster. Keep in mind:

1) The motorized lifeboat has only enough fuel to last for 24 hours at full throttle (or six knots) in a calm sea.

2) Rowing is very slow and uses a lot of energy.

3) The standing lug rig is a very poor sailing rig.

Thus, the most sensible thing to do is to stream your drogue and try to stay as near to the vicinity where the ship was abandoned as possible. Doing this will increase your chances of being quickly rescued.

To further ensure the rescue of survivors, the United States Coast Guard operates a rescue system call the **Automated Merchant Vessel Report System** (AMVER). Merchant vessels of all nations making offshore voyages are encouraged to send sailing and position reports to the AMVER Center at New York. These radio reports include destination, speed, ship characteristics, and medical capability. This information is entered into a computer which can update ship positions in any needed geographical location.

Chances are there won't be a Coast Guard rescue unit near the disaster scene. But one of the several thousand merchant vessels sailing the oceans might be nearby. The Coast Guard in New York would ask the AMVER computer for an updated list of ships near the disaster scene. Radio

telegrams would be sent to those nearby ships, directing them to the scene of distress. All mariners are required by law and custom to stop and aid vessels in distress. Meanwhile, a Coast Guard rescue aircraft and/or cutter would also be sent.

All the navigable waters of the world are covered by international search and rescue organizations. These organizations are set up to provide speedy communications and services for successful rescue efforts. So do all *you* can to help the search and rescue units save you. If you learn what to do in a survival situation beforehand, you will be capable of surviving without your ship until help arrives.

B. Abandoning Ship

Life Jackets

Life jackets are officially known as **personal flotation devices (PFD)**. The word flotation means that the jacket will keep you afloat without your having to swim. PFD's are sometimes called **life preservers**.

The most common life jacket has top and bottom tie tapes and a hooked body strap in the middle. The top and bottom tapes are tied in a bow knot just like your shoes. The body strap is hooked and then pulled tight by its end webbing. Although there are smaller life jackets for children, in an emergency, an adult size PFD can be adjusted and used. Kapok life preservers require proper care and should **not** be stowed near open flame or where smoking is permitted. Nor should they be left on open decks or used for seats, pillows, or footrests.

Personal Floatation Device
Figure 4-1

The regulations require that life jackets, like all lifesaving equipment, must be maintained in good serviceable condition. You should take care of your own PFD and keep it available for immediate use at all times.

Each life jacket has the following features: (a) a **signalling whistle** attached to the end of a cord; (b) **reflective patches** to return the light from a searchlight, and (c) a small water **light**. Finally, each life preserver must be stenciled with the **vessel's name**.

Entering the Water From a Height

If you have time, put on extra clothing. Include an outer layer of wind and waterproof clothing with head cover and gloves. (See list, page)

Secure your life jacket properly. Pull all ties tight. If you do not secure your life jacket properly, you could injure your head when you jump.

Get down to a height of less than thirty feet if possible. Below fifteen feet is ideal. If you jump from higher than thirty feet, you will probably injure yourself. It will depend on the height from which you jump and the angle in which your body hits the water.

If you have false teeth, a hearing aid, eyeglasses, contact lenses, or a glass eye, remove them. Also remove any sharp objects from your pockets.

Assume the **Jump Position:**

1. Block off nose and mouth with left hand.
2. Cross your right hand over your left hand and hold the life jacket securely.
3. Look down to be sure nothing is in the way.
4. Looking ahead with toes over the edge, step off keeping feet together. Remain in this position until you bob back up to the water surface.
5. Board the survival craft as soon as possible.

Jump Position
Figure 4-2

Saving Your Strength

Once you are in the water, get away from the danger. Then swim as slowly as possible toward safety. Do not swim or thrash about any more than necessary because: (1) you will lose your body heat, and (2) you will lose your strength. You'll need your strength to pull yourself into the survival craft.

Let your life jacket support you in the face-up position.

C. Swimming for Survival

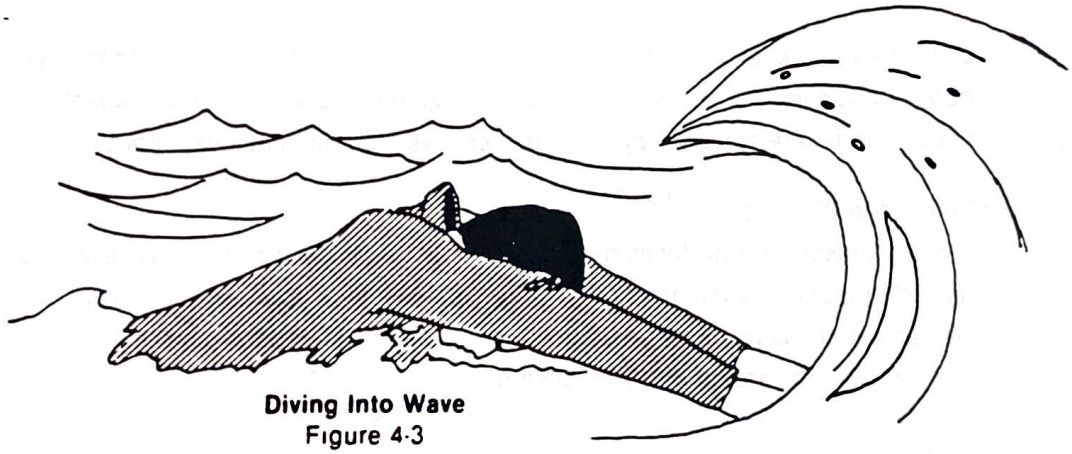
Dealing With Wave Slap

In rough weather, waves and spray may be blown into your face. You can protect your face by cupping your hands over your nose and mouth. This will also help you breath normally.

Swimming in Surf and Currents

If you are in the water near a beach, knowledge of the tides, currents and surf will help you.

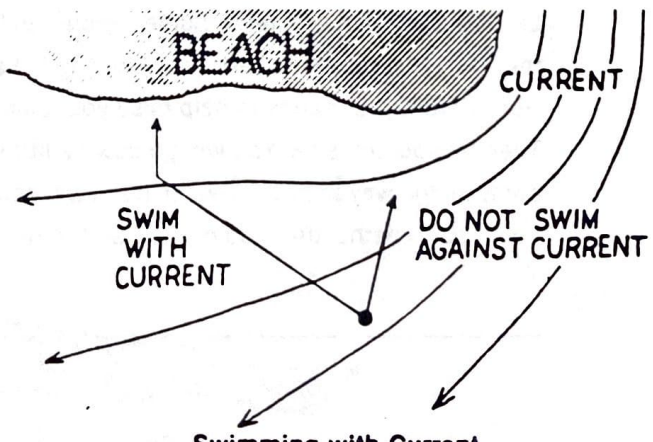
Small waves break in shallow water. Large waves break further out. If the surf is small, you can ride a small wave (body surf) by swimming forward with it as the crest picks you up. Roll out of it just before the wave breaks. If the surf is high, swim toward shore while in the trough between waves. When the next wave comes, cover your nose and mouth, hold your breath with your back to the wave until it passes. If you do not have a life jacket and you are a good swimmer, you may face the wave and dive under it.



Diving Into Wave
Figure 4-3

Waves may break on reefs and sandbars miles from shore. Look for a channel or opening where the waves do not break as they go to shore.

There are several types of dangerous water currents. If you get caught in a current, **don't fight it.** Swim parallel to the shore or diagonally across the current just as you would in a river current. Head toward shore only after you are out of the current.



Swimming with Current
Figure 4-4

Swimming Through Burning Oil on the Water

You may need to abandon ship by jumping into water that is covered with a layer of burning oil. If you can, jump into the water at the bow or the stern on the windward side of the vessel.

Do not try to swim through burning oil or debris. If you must go through the flames to get to safety, swim underwater. Remove your life jacket first. Also remove your shoes. It will make swimming easier. You should keep your other clothing on. It will protect you from the flames and debris.

Stay underwater as long as you can. When you need to take a breath, come to the surface with your arms over you head. Use your hands to break the surface and move them in a circular, thrashing motion to beat away the burning oil. Turn your back to the wind. Continue to beat away the burning oil with your hands. Take a deep breath and go back under water feet first. Then swim to windward, underwater, towards safety.

Floating With No Life Jacket

If you find yourself in deep water with no life jacket, try to find floating debris to hold on to. If you can't find any debris to help you float, don't panic and thrash about. You will only wear yourself out. You can stay afloat with no life preserver by using one or several of the methods below.

1. **Air Trapped in Clothing**

   If you are dressed warmly for cold weather, remember that your clothes have a lot of air trapped in them. Use this trapped air to stay afloat. Lie on your back with your head back so your nose and chin are above water. Remember, the more you thrash about, the more air will escape from your clothing.

2. **Backfloat**

   If the seas are calm, try lying on your back with your head above water. (See Figure 4-5.) Let your arms and legs relax. Some people can float well this way; others sink because they do not relax. Try to keep your lungs full of air. Do not panic if your face does sink. Gently work your hands to help raise your chin out of the water. Take a short breath. Then let yourself sink. You will go down a little and then come up. Your face may not come all the way above the water, but it will come close. After a while, you will learn to gulp your breaths after you drift up and to rest and relax as you go underwater.

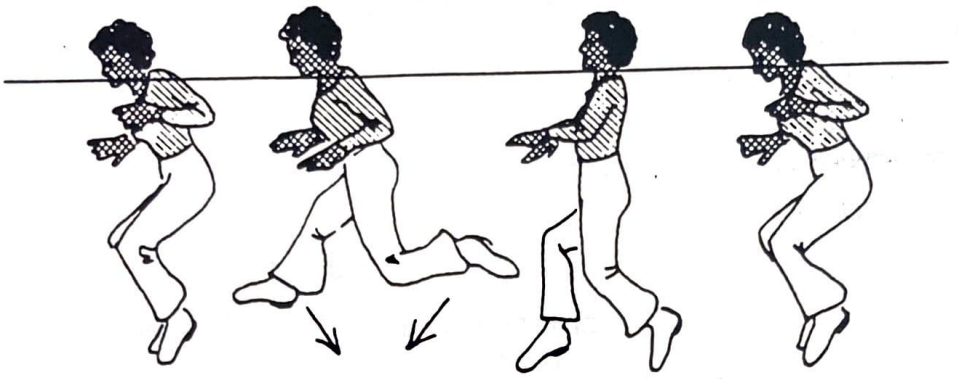
Backfloat
Figure 4-5

3. **Tread and Scull**

If you want to raise your head and look around or call for help, you will need to tread water. There are many methods for treading water. The following method is called the **single scissors kick.** (See Figure 4-6 and 4-7.)

Leg action for Treading:

1. Put legs together.
2. Bend the knees.
3. Work legs like scissors - back and forth.

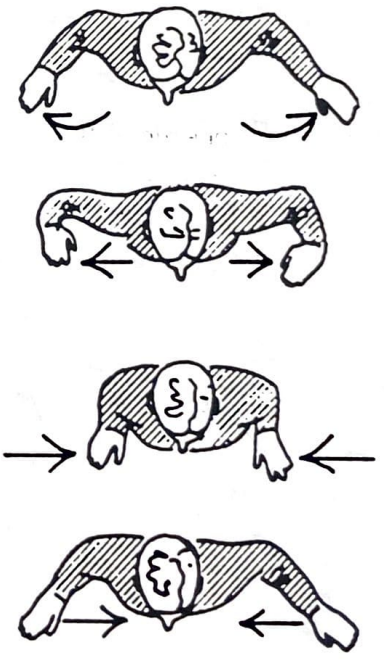


Scissors kick (treading)
Figure 4-6

Hand Action for Sculling

While you're moving your legs in the single scissors kick:

1. Place your hands palm down on the water.
2. Press hands down several feet in the water, moving them slowly side to side.
3. Bring your hands back to the surface.
4. Repeat the motion.



Hand Action (sculling)
Figure 4-7

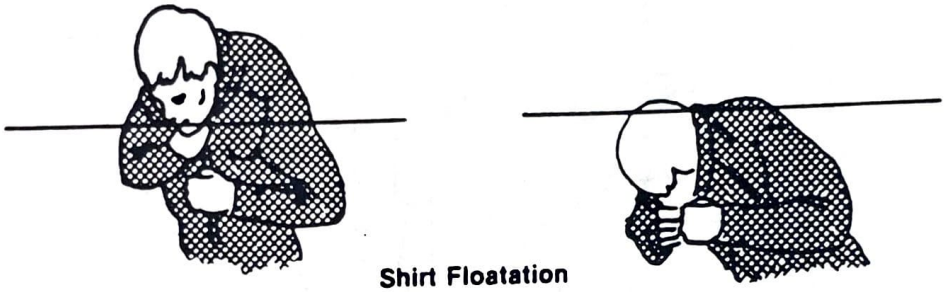
4. **Clothing**

Remember that your clothing protects you against exposure. Only remove clothing that weighs you down or clothing that you can use to help you keep afloat.

Shirts

To use your shirt to stay afloat (See Figure 4-8.):

1. Button it at the collar, so it's tight at the neck.
2. Take a deep breath
3. Bend your head forward.
4. Pull the shirt to your mouth and blow between the second and third buttons. The air will rise to form a bubble at the back of the shirt. It may be necessary to hold the shirt collar tightly to stop the trapped air from escaping.

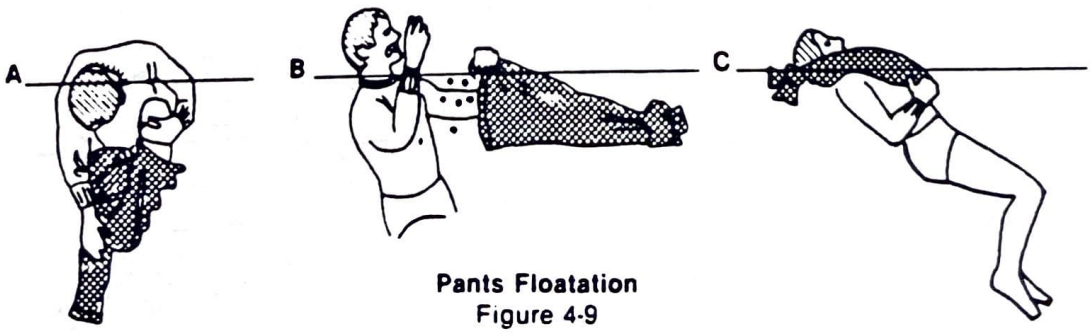


Shirt Floatation
Figure 4-8

Pants

To use your pants to stay afloat (See Figure 4-9.):

1. Remove your pants while in a jellyfish float position.
2. Tread water.
3. Tie both legs together as close to the bottom cuff as possible.
4. Pull the zipper up.
5. Hold the back of the waistband with one hand as shown in Figure 4-9-B. Splash air into the open waist. Use your free hand and strike downward with your palm. Carry the motion through to a point just below the open waist.
6. Slip your head between the legs of the pants which were tied together.



Pants Floatation
Figure 4-9

Dealing With Sharks

Probably the most important thing for you to remember about sharks is that they are unpredictable. Vibrations and odors appear to attract sharks at a distance. At short range, they are drawn to what they can see.

Sharks are very curious and will investigate any object in the water. They are likely to attack something that's dead or wounded and bleeding. Blood in the water attracts and excites them. If you or other survivors are bleeding, stop the flow of blood as quickly as you can. Also be very careful if you clean fish at the edge of the survival craft. Don't trail your hands or feet in the water when sharks are nearby.

Stay with your shipmates. Sharks are less likely to attack groups than a person by himself. Remain still and quiet in the water.

Clothing, especially if it is a dark color, is good protection. Light colored objects seem to attract sharks.

D. Man Overboard

If you fall overboard, do not swim toward the moving ship. Remain calm. Attract as much attention as possible. Then, stay afloat using one of the methods described in this chapter.

When a person is seen falling overboard, several ring buoys should immediately be thrown by anyone near them. If it is at night, water lights should also be thrown. A smoke float would be helpful in the daytime. Hail and pass the word **"Man Overboard, Port (or Starboard) Side"** to the wheelhouse. Lookouts should go high on the ship and keep their eyes on the person.

The mate on watch will turn the stern away from the person who has fallen overboard. This will lessen the danger of hitting him with the propeller.

Throw a lifering and pass the word to the wheeelhouse. At night, a water light should be thrown. A smoke float would be helpful during the day. (See figure 4-10.)

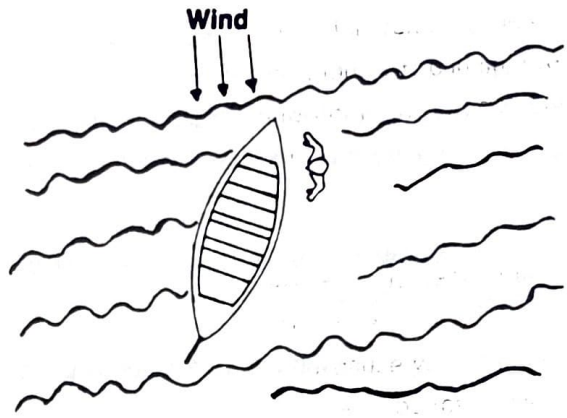
Man Overboard
Figure 4-10

The ship's master may use the ship or a lifeboat to recover the person. If the ship is used for recovery, a cargo net or ladder should be hung over the side. The lifeboat should be made ready in case there is a problem in recovering the person with the ship.

If a person is injured so he cannot help himself back aboard, a swimmer wearing a lifeline, life preserver, or cold water exposure suit should enter the water.

If the master decides to use a lifeboat for recovery, the coxswain should approach the person nearly into the wind with the wind just off the bow. **Place the person on the lee side of the boat.** This will provide a calmer sea for rescue and will ensure that the lifeboat does not drift away from him.

If the person is drowning, he needs help immediately. Approach him in the most direct manner possible.



Man Overboard Recovery
Approach nearly into the wind and sea.
Place the person on the lee side of the boat.

Figure 4-11

E. The Williamson Turn

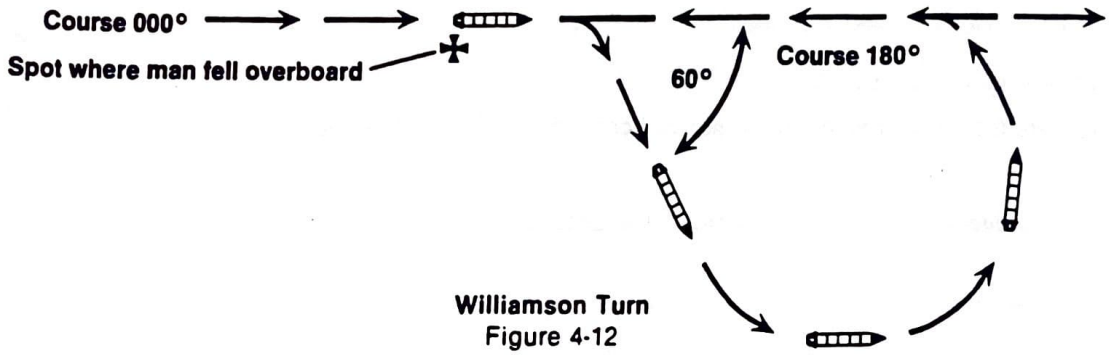
If the man overboard has been lost from view, the **Williamson Turn** is useful. This type of turn causes the vessel to retrace as closely as possible the course it was on when the man fell overboard. (See figure 4-12 below)

The Williamson Turn is executed as follows:

1. Depending on which side the man falls overboard from, put over full rudder (30°) to that side. This action swings the stern away from the man. When the ship has swung sixty (60) degrees off the original course, shift the rudder to the opposite side ("shift your rudder"). The vessel will gradually stop swinging in the original direction and then swing in the opposite direction. Continue swinging in this opposite direction until the vessel is on the reverse (reciprocal) heading from the original heading.

2. When a vessel heads on the new course, put the rudder hard over to the other side ("Shift your rudder") until the vessel is on a reverse course (180°) from the original course.

3. Original speed should be maintained until the vessel is steady on the reverse course.



Williamson Turn
Figure 4-12

F. Organizing for Survival

Leadership and Morale

Good leadership and high morale are very important for survival. Good leadership creates high morale.

The leader must take on the responsibility of keeping the other survivors as organized, calm,and comfortable as possible.

Every survivor must keep a positive attitude after abandoning ship. Do not let thoughts about giving up enter your mind. **Believe that you are going to be rescued!** Do everything you have learned to do to keep alive. Many people have died because they gave up the will to fight for their lives.

The Leader

If there are ship's officers in the survival craft, the senior officer will take command. If there are no officers, the senior crew member with a lifeboat endorsement will take command. If it is not clear who is the senior member on the survival craft, a leader should be elected.

If you are in charge, it is very important for you to tell the other survivors what you are and will be

doing. When you do something or tell someone else to do something, explain to **everyone** why it's being done. This may help prevent the other survivors from worrying or having doubts. You must do everything you can to stop the crew from being scared. Use the materials in the survival craft to show the survivors that there is shelter, safe floatation, food, water, signalling devices, and companionship for them. Be a cheerful but firm leader. Keep things organized and always maintain positive discipline.

Establishing the Routine

If you are the senior person in the survival craft, do the following things:

1. Collect sharp objects or potential weapons.

2. Have a roll call.

3. Establish a routine and assign duties to able survivors:
   a. Ration keeper
   b. Lookouts
   c. Repair party
   d. Bailers
   e. First aid persons
   f. Signalling

It is important to keep the minds of the survivors occupied during waking hours. But don't overdo it, avoid unnecessary work.

Organize **one hour watches in pairs**. One watchstander has duties outside and one inside.

Outside:
1. Lookout for ships, survivors, aircraft and useful wreckage.
2. Gather useful wreckage
3. Flash the signalling mirror all around the horizon when there is sunshine.

Inside:
1. Maintain the survival craft (bailing, drying, ventilation, etc.)
2. Supervise things while others rest.
3. Attend to injured persons.
4. Look after equipment.

Staying Together

The old saying "There is safety in numbers" is important to your survival. If boats make it off the vessel, use them to collect the rafts and tie them together. Two or more boats and rafts tied together are easier to spot. When you stick together, rations, equipment, knowledge, and comfort can be shared.

Boats should also make several thorough searches of the disaster area to look for lone survivors or dead bodies. During these searches, any equipment, food or other useful debris may be collected and shared with the group.

G. Survival on the Sea

All right, you have abandoned your ship, picked up all the people in the water, and gathered and tied all of the survival craft together. Now, what should you do next?

1. The leader (lifeboatman in charge) should check that he has done all of the organization things described in the previous section ("Organizing for Survival").

2. The sea anchor on each and every craft should be set. An anchor watch should also be set to watch the lines.

3. During heavy weather a watch should be kept on breaking seas so that people in the survival craft can be warned of incoming water. This helps prevent the loss of food and fresh water by salt water contamination.

4. The anchor watch should make sure that the holding line to the drogue does **not** foul on the side of the survival craft, because this could cause the craft to broach (turn sideways to the wind and seas). Broaching is especially dangerous because it risks capsizing the craft.

5. If your boat were to capsize, the best thing to do is for everybody to get on one side of the boat's hull and use the grab rails to right the boat. Rafts are righted with use of righting straps. (See Figure 3-19.)

6. If you must move the lifeboat in heavy seas, it is best to go into the waves with the wind and seas coming broad on either bow (at about a 30° to 40° angle). The forward motion of the boat will give you some steering control and help you keep the boat from broaching. For safety's sake, it is better **not to** try to make headway, unless you are being blown onto a reef or into some other danger. Instead, put out the drogue and drift with your bow into the wind and waves.

H. Beaching Survival Craft

Beaching A Liferaft Or Lifeboat

Landing through surf, unless absolutely necessary, should be avoided. The Coast Guard and lifesaving organizations of foreign nations, whose duties require the launching and beaching of boats through surf, have crews familiar with local conditions, boats designed for this operation, and men trained and physically conditioned. These conditions do not usually exist for a merchant vessel survival craft, particularly when children and elderly persons may be among those to be landed.

- **Remember to put your lifejacket back on before entering the surf line!**

It is better to go through a break in the reef at the mouth of a stream or wherever you see a depression or valley in the shore line. Openings in reefs may also be discovered by the action of breakers. Waves that do not break on the reef but continue their run toward shore indicate a channel or area generally clear of rock and coral.

Because the surf will always appear smoother when viewed from a survival craft, extreme caution must be used before entering the surf. You should take some time to study the pattern of the waves before trying to beach the survival craft.

If it is necessary to beach **a pulling boat** (a boat powered by rowing), you should keep the boat's bow to sea and row to meet breaking waves. In other words, **beach the boat stern first.** The sea anchor can be used to assist in keeping the boat from broaching. It is best to rig the drogue with a tripping line over the bow, then use the oars to back ashore, tripping the drogue between breakers and slacking off on the trip line to steady the boat during the passage of a wave crest. Before starting in, install the sweep and stow the rudder; the steering oar gives you more control when backing in. Row to meet the breaking waves and back the oars between swells.

The best procedure for landing a **power driven boat** on an unfamiliar beach is to secure (turn off) the

engine, put out the oars, use the sweep instead of the rudder, and follow the same advice given in the paragraph above for a pulling boat. Don't forget to back in, using the drogue attached to the bow, and tripping it between breakers.

You should use great caution when **beaching a raft** surf and rocks. This should not be attempted at night unless it's absolutely necessary. The senior person will probably decide to stream the sea anchor and wait until daybreak to paddle the raft ashore.

The raft can be punctured by sharp rocks and coral found near a beach. You and the other people may be spilled into the water. The depth of the water, its temperature, the physical condition of the survivors and the distance to shore should be considered.

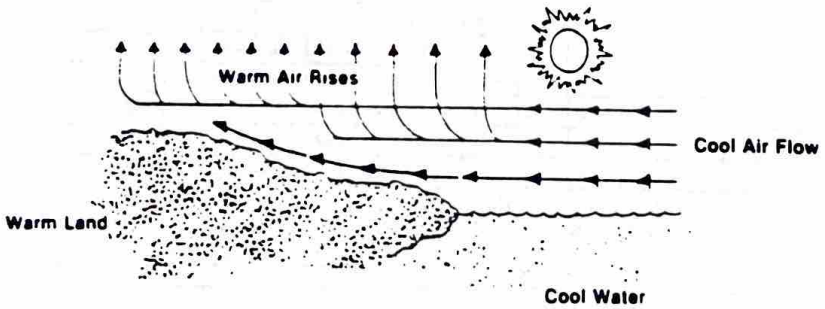
Open both canopy curtains of the raft to reduce wind resistance if going against the wind. If you are trying to land an inflatable raft with help from an onshore breeze, remember to take in the sea anchor in the morning when the breeze starts to blow toward shore. Stream the sea anchor at night to prevent the raft from drifting rapidly away from shore. When the raft is close to land, the paddles can be used. However, the raft is hard to paddle. The extra work may be too much for weak survivors. It may be necessary to rely on wind and waves.

Sea Breezes Near Land

If you are drifting near shore, you are more likely to get an onshore wind pushing you toward the beach after the sun rises and begins to heat the land.

In the daytime, the sun heats the air over the land. Over water, the air temperature remains almost the same. As the air over the land is warmed relative to the air over the water, it rises. The cooler, heavier air over the water moves toward the shore to replace the heated, lighter air. The moist air rising causes clouds to form. These are cumulus clouds.

In this way sea breezes are created. Sea breezes sometime blow over 15 knots and can be much stronger when they are in the same direction as the normal wind. The normal wind is caused by the existing atmospheric pressure over the area.



Sea Breeze
Figure 4-13

I. Cold Water Survival

Water can conduct heat twenty five or more times faster than air. That means when you're in the water you can lose body heat very quickly. If you are in the water and the water's temperature and the weather conditions are severe enough, you may find your life expectancy (how long you can survive) greatly reduced. You **can survive** if you learn about **hypothermia,** how to prevent it, symptoms that indicate that hypothermia is taking place, and first aid for hypothermia victims.

Hypothermia

Hypothermia is the loss of body heat. **Your normal body temperature is 98.6°F.** If your temperature becomes lower you can become a hypothermia victim. Hypothermia can occur either in or out of the water. If it happens out of the water, such as working outside on deck, it is because you have not prepared for such cold weather, or you think you can handle the cold weather when you really can't. Hypothermia usually develops when the air temperature is between 30° and 50° F.

When such low temperatures are combined with wind, the possibility of hypothermia taking place increases. This happens because of **windchill**. Windchill is the effect of the wind on body temperature. The wind carries off the heat of the body which lowers the body's temperature. Windchill makes the temperatures much more severe.

This chart shows how wind and ship speed together can make air temperatures feel much lower. (See Figure 4-14.)

U.S. CUSTOMARY WIND CHILL CHART

Combined Speed of Wind and Ship in MPH	Actual Thermometer Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Temperature (°F)											
0	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-86	-100	-116	-132	-148
(wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER* for properly clothed person				INCREASING DANGER*			GREAT DANGER*				

*DANGER FROM FREEZING OF EXPOSED FLESH

Wind Chill Chart
Figure 4-14

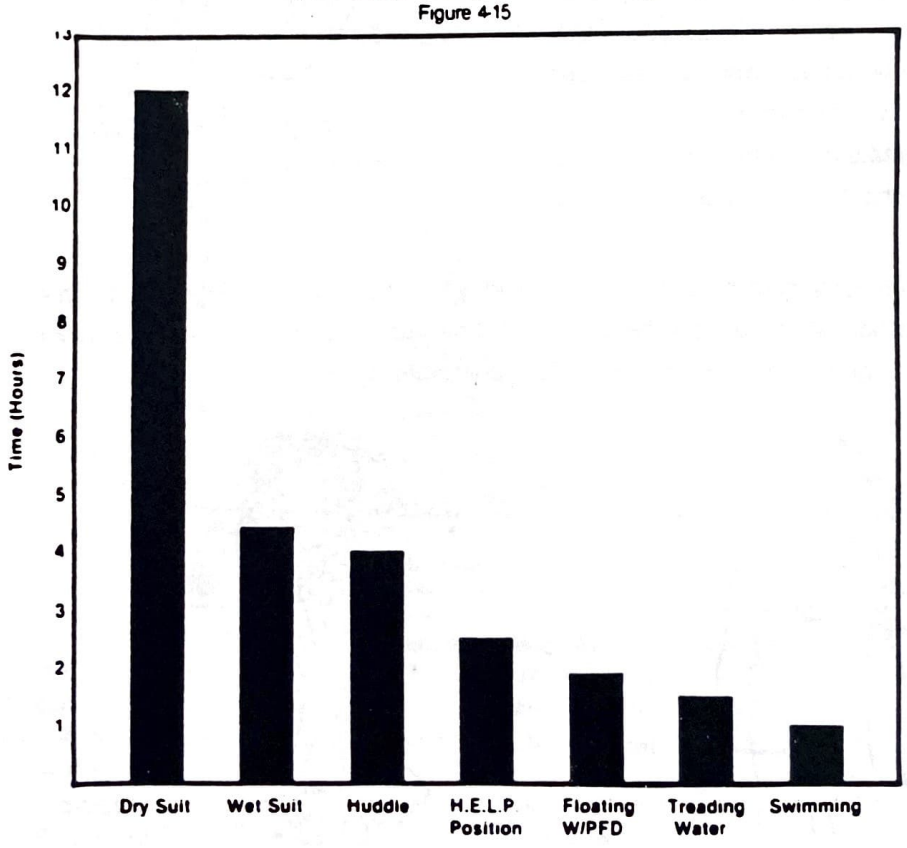
Often, hypothermia victims do not realize how dangerous it is to be wet in cold temperatures. Victims become wet from sweating, being out in the rain or snow, or being splashed or sprayed by waves. Survivors from a maritime disaster who have spent some time in a survival craft can easily become hypothermia victims.

If you are immersed in cold water, hypothermia may begin to develop in as little as ten to fifteen minutes. However, it can take several hours. It takes place because an average person in water temperatures of 70°F and lower cannot generate (make) enough heat to keep up with the heat that is lost to the water (see Figure 4-15).

Drinking alcohol does **not** stop hypothermia from developing. Drinking alcohol could increase the risk of hypothermia.

If you find yourself in cold water with no life jacket and you're near shore or other safety, you have a tough decision to make. You have to decide whether to swim for safety or not. Muscle exhaustion and numbness occur very quickly if you are swimming in cold water with normal clothing. Experiments show that a good swimmer in 45°F water becomes completely exhausted after swimming ten minutes! He is no longer able to remain afloat because of the loss of muscle sensory control. Drowning then occurs. This type of death is not associated with the body core hypothermia. Cold affects the skin and muscle control much faster than it affects the body core.

Survival Time vs. Method of Survival
(At a Water Temperature of 35°F)
Figure 4-15



Methods of Survival
Average Hypothermia Survival Time vs Water Temperature

This chart shows a very rough estimate of when death due to hypothermia may occur. Many things can increase or decrease survival time, such as body fat, physical fitness, clothes and exercise. This chart does not show when unconsciousness might occur. Hypothermia can cause unconsciousness and the risk of drowning long before it causes death.

Preventing Hypothermia And Death From Cold Water

1. Wear several layers of insulated clothing. The outer layer should be waterproof. A dry exposure suit covering the entire body except for the eyes and nose is ideal.

2. Wear a life preserver or an exposure suit.

3. Enter the water slowly to prevent the possibility of sudden shock to your system.

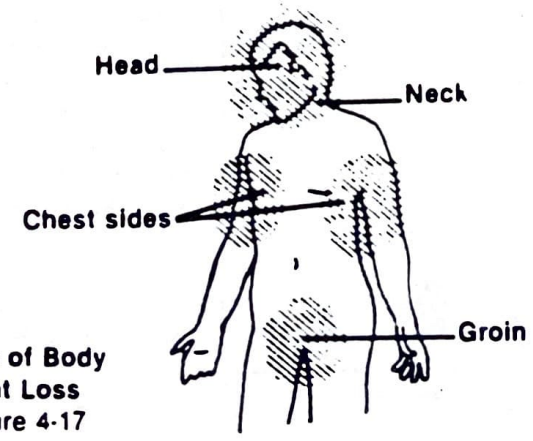
4. Stay as still as possible while in the water. This will keep more air trapped in your clothing for floatation and thermal insulation.

5. Move slowly toward floating objects. Get as much of your body out of the water as possible.

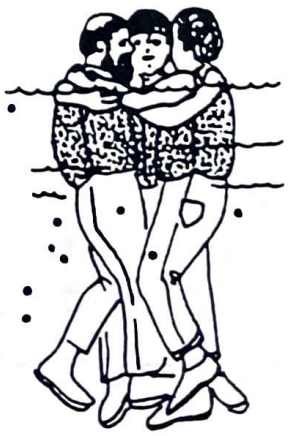
6. If forced to remain in the water, get into the **H.E.L.P.** position (Heat Escape Lessening Posture - Figure 4-16). The buoyancy of some life jackets may turn some people face down if the position shown here is taken. It may be necessary for you to keep your arms crossed close to your chest with your crossed legs extended and down in order to float face up. This modified position will help keep your head out of the water. It helps you retain (keep) your body heat and may increase your survival time by fifty percent. This protects the areas of greatest heat loss which are the head, neck, chest sides, and groin. (See Figure 4-17.)

H.E.L.P.
Figure 4-16

7. If you are with other survivors, huddle together with your sides touching (Figure 4-18), this cuts down on heat loss from the head, neck, chest sides, and groin. It also provides rescuers with a larger visual target and is good for morale.



Areas of Body Heat Loss
Figure 4-17

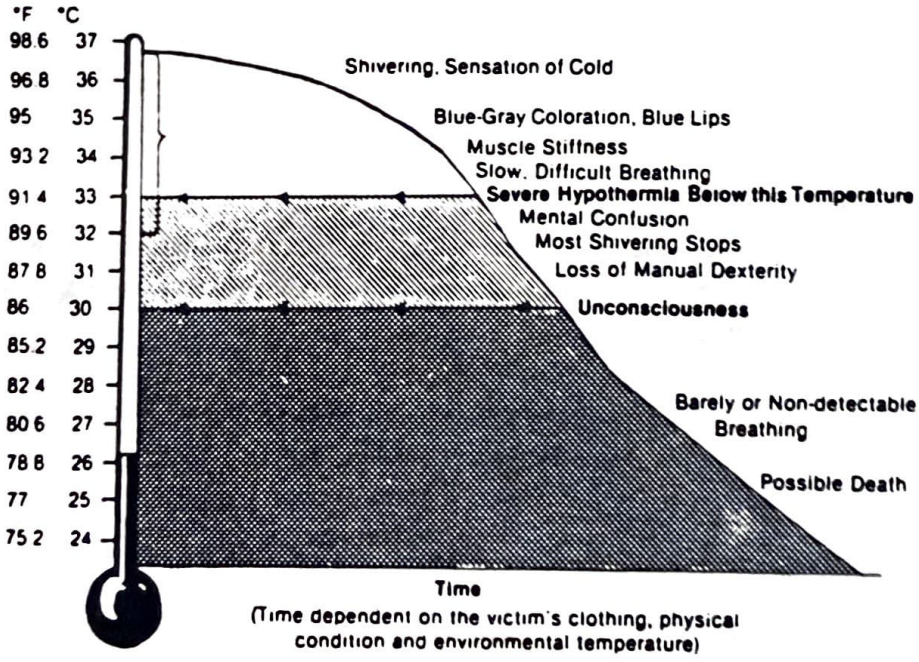


Huddle
Figure 4-18

Symptoms Of Hypothermia

Hypothermia may not be easy to spot. Look for these symptoms:

1. Violent shivering until severe hypothermia sets in.
2. Blue-gray coloration and bluish lips.
3. Slow and/or difficult breathing.
4. Stiff and/or uncoordinated body movements.
   a. Loss of ability to use hands and feet.
   b. Muscle spasms (jerks).
   c. Drunk or drugged appearance.
5. Mental confusion.
   a. Forgetfulness.
   b. Change in personality.
   c. Loss of ability to make decisions.
   d. Making wrong decisions.
6. Loss of consciousness.
7. Appears to be dead.



Symptoms Related to Deep Body Core Hypothermia

Deep rectal temperature should be taken. Oral temperature is not reliable in a hypothermia victim. Symptoms alone can be misleading. Time the victim has been exposed can be misleading also. Deep body core temperature is the only reliable source of hypothermia severity. Recovery is possible as low as 18°C (64.4°F).

Temperature/Symptom
Figure 4-19

Types Of Hypothermia

The most reliable way to identify the severity of hypothermia is by body core temperature. Oral temperature is not reliable. Rectal temperatures ten to fifteen centimeters deep must be obtained. You are not likely to have a thermometer available. Therefore, you may use two other ways to identify hypothermia victims: (1) symptoms and/or (2) time of exposure to cold.

If the victim is coherent, logical and shivering strongly, his core temperature is probably above 91°F. This is considered **mild hypothermia.**

If the victim is very confused and acts drunk or drugged and seems about to or does pass out, assume that his core temperature is 91°F or below. This is **severe hypothermia.**

Remember, though, **symptoms can be deceiving!** Every person is different. If the person has been exposed to cold for a long period of time under conditions which could produce severe hypothermia, treat him as though he had severe hypothermia. **If in doubt, treat the victim for severe hypothermia!**

First Aid For a Mild Hypothermia Victim

1. Move the victim into a warm environment and allow his body to warm naturally.

2. Watch the victim closely for worsening symptoms.

3. If in doubt, treat the victim for severe hypothermia.

First Aid For A Severe Hypothermia Victim

1. Remove the victim from the cold surroundings. Handle him as little and as gently as possible (his heart is in an unstable condition). Do not let the victim exercise; you do the lifting and moving. Wrap him in a warm, dry blanket.

2. Prevent further heat loss by gently removing the victim's wet clothing. You can do this by cutting his clothes off. This stops unnecessary movement that could produce shock in the victim.

3. You will need to begin rewarming the victim if medical help is not immediately available. You should try to rewarm the chest sides and groin area first. These are the areas of greatest heat loss. It is important that you apply only gentle heat to restore the victim's body core temperature. Rapid rewarming of a severe hypothermia victim is dangerous; it could cause severe shock or possible heart failure. The following rewarming techniques use gentle heat methods to restore the core temperature:

   a. Wrap the victim in a warm, dry blanket or dress him in clothing that has been warmed.

b. One or more rescuers lie with their naked bodies against the victim's naked body in a sleeping bag or under a bianket.

c. If the victim's breathing rate is slow and irregular, use your warm breath to provide warm oxygen for his lungs. Breathe into the victim's mouth as he inhales. It is important that **you breathe with the victim, not against him.** This mouth-to-mouth resuscitation can be used even when the victim is breathing on his own. If the victim is not breathing, begin mouth-to-mouth resuscitation immediately. Your breath contains enough warm oxygen for the victim's needs.

d. When the victim is conscious, rescuers may give him warm liquids (coffee, hot chocolate, etc.). **DO NOT give him any liquids if he is NOT CONSCIOUS. DO NOT give the victim alcohol in any form.** Alcohol increases the rate of heat loss!

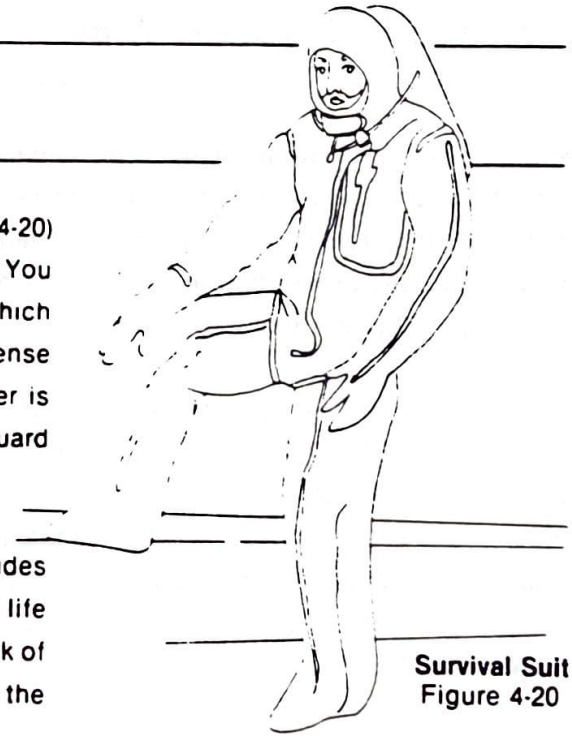
4. Get the victim to a hospital or other medical facility as soon as possible. His body has undergone serious biochemical and fluid changes. Avoid bumping and jostling the victim while moving him if it is possible. **Transport as soon as possible!**

Don't give up on a hypothermia victim too soon! Victims have fully recovered even though they had no apparent life signs for up to forty four minutes. Body core temperature has fallen as low as 64°F; then after proper treatment, recovery was complete. When hypothermia is suspected, complete recovery is possible even though life signs have disappeared. **Get the victim to a hospital!**

J. Cold Water Survival Suits

Cold water survival suits are (See Figure 4-20) provided for crew members aboard some ships. You may also purchase one to carry aboard ships which do not provide them. They are the best defense against hypothermia. Survival time in cold water is greatly increased by wearing a U.S. Coast Guard approved cold water survival suit.

In addition, the cold water survival suit provides sufficient flotation to keep you afloat without a life jacket. There is an air chamber located in the back of the head section of the suit which is inflated by the



Survival Suit
Figure 4-20

oral inflation tube. The zipper of the survival suit should be lubricated with bee's wax or paraffin.

These suits are sometimes called cold water exposure or immersion suits.

To survive in a cold climate, you should:

1. Keep warm and dry.
2. In the liferaft, close the canopy curtains or close the doors in an enclosed lifeboat.
3. Huddle together for warmth.
4. Do simple exercises to help stay warm. These will keep your blood circulating but will not waste energy.
   a. Open and clench your fists.
   b. Stretch your arms and legs.
   c. Wiggle your toes, ankles, fingers, and wrists.
5. Avoid exposure - rotate the lookout often.

K. Preserve Body Fluids - Avoid Seasickness

Liferafts are very uncomfortable to ride in. Your raft will be in constant motion even on a calm sea. Every time someone moves inside or the water moves underneath, the raft will wiggle. You will be confined in a cramped and stuffy space. Even the most experienced seafarers tend to get seasick in a raft. Seasickness must be avoided if at all possible. It is a very miserable illness and can affect your will to survive.

If you have anti-seasickness pills aboard ship, take one before you abandon ship if you can. If you can't, take the anti-seasickness pills provided in the raft's supply kit as soon as all of your shipmates have been helped into the raft. The pills will keep you from vomiting. Vomiting empties your stomach of valuable fluids. You must preserve (keep) those body fluids. If you lose them, they will be difficult or even impossible to replace as long as you're in the raft. Remember how cramped your survival conditions may be. If one person vomits, others will probably do the same. **TAKE THAT ANTI-SEASICKNESS PILL AS SOON AS YOU CAN!**

L. Covering Up

The dangers from exposure to **cold** are obvious, but don't forget the **sun, wind, rain,** and **sea.**

The liferaft comes with a built-in canopy to protect you. Modern covered lifeboats are excellent for protecting you from exposure to the sun and weather.

Open lifeboats have the protective cover with portable frames for spreading the cover over the lifeboat.

Stay under the cover or wear light clothing. Serious burns and loss of valuable body fluids could result from a sunburn.

In moderate seas, when there is no danger of the raft capsizing, you should take your life jacket off and sit on it. The rubber raft constantly moving under you tends to wear your skin until soreness occurs. Your life jacket will provide a cushion that will prevent such soreness.

To survive in a hot climate, you should:

1. If possible, keep a breeze blowing through the survival craft. Sometimes you can change the position of the sea anchor to increase ventilation (movement of air).

2. Avoid sunburn.

3. Reduce need for water by avoiding any extra exertion. If you exert yourself, you will sweat and use a lot of body fluids.

4. Keep the outside of the raft wet.

5. Wet your clothing during the day with sea water.

M. Drinking Water

The normal, healthy body at rest can stay alive for over forty days with as little as eleven ounces of fresh water each day and no food. As little as two or three ounces of drinking water each day can keep a person healthy for up to ten days. Without fresh water, a person often becomes delirious in about four days and might die in eight to twelve days.

No Water for the First 24 Hours

Do not issue water during the first 24 hours. The body is already full of water. If you drink more, it will probably be wasted in the form of urine. After 24 hours, your body will be dryer and will absorb the water you drink. This is just like a dry sponge which holds water while a wet sponge will not. If a survivor has lost blood or has been burned, you may give him water during the first 24 hours. The survivor will need it to replace the fluid he has lost through his bleeding or burns. **ONLY give him water if he is conscious.**

After 24 hours, you may issue a full daily ration of **one pint** of water for each person. The ration should be divided into three equal parts. One part should be drunk at sunrise, one at midday and one at sunset.

Rain Water

You may collect more water by catching rain water. In an open lifeboat you can use the boat cover and boat buckets to catch rain water.

Some parts of the inflatable liferaft canopy are designed to catch water. **Rain water catchment tubes** will take the water into storage bags on the inside of the raft. (The storage bags are in the raft's equipment container.) Salt spray may dry on the canopy, and salt might be washed in with the first few ounces of rain water. It might be very difficult to collect uncontaminated rain water when the seas are rough and waves are constantly being blown onto the canopy.

The lookout should alert everyone when it rains. All available containers should be filled with rain water. The equipment accessories bag, ration packs and empty tins can be used. After all of the containers have been filled, everyone should drink as much of the rain water as they can.

Condensation

Water might condense on the inside canopy of the inflatable liferaft. Use one of the cellulose sponges that is provided in the raft equipment to soak up the water. Squeeze the water out and drink or store it. Be sure to keep one sponge clean and free of salt water for this purpose.

Eating Snow and Ice

In the Arctic Sea you can collect **old salt water ice.** It is bluish in color with smooth, rounded corners. It is usually pure enough to eat or drink. Do not make the mistake of eating **salt ice.** Salt ice is gray and milky. **It should not be eaten.**

Remember, ice and snow tend to chill your stomach and reduce your body temperature. If you are on the verge of hypothermia, you should not eat ice or snow. Allow it to melt and get as warm as possible.

Never Drink Sea Water or Urine

Rain, ice and condensation are good sources of water. Do not mix salt water, urine or animal fluid with fresh water to stretch your water supply. Drinking sea water will only worsen your thirst and increase water loss by drawing body fluids from the kidneys and intestines. The salt will go to the brain and cause delirium and convulsions.

Drinking sea water and/or urine during a survival situation could cause madness and death.

N. Food

Food From Emergency Provisions

The emergency food pack in your survival craft is highly concentrated. It is full of carbohydrates and vitamins. It does not contain salt and is low in protein because salt and protein quickly use up valuable body fluids.

Do not eat during the first 24 hours. After 24 hours, you can eat four ounces of food each day. In a lifeboat the food will last nine days. In a liferaft the food will last five days. You will have extra rations (food and water) if the boat or raft is not carrying its full number of passengers.

If you have no water, **do not eat food.** Your body needs water for digesting food. Eating without drinking fresh water can cause death.

Food From the Sea

The sea has many different forms of life. If you have enough fresh water, you will probably not starve to death. Remember, **water is a must.** Because fish and birds are rich in salt and protein, more water is needed to digest them. *Do not* eat food from the sea unless you have two or three times more water than your daily ration.

If you do not have enough water to drink with your seafood or if you can't catch any seafood right away, **don't panic.** You probably abandoned ship with excess body fat. Your system will begin to use the fat if you do not eat. One pound of body fat will probably keep your system working at about the same rate as two meals. The rate at which body fat and protein are changed to heat and energy depends upon air temperature, your activity and your mental state. You can live longer on your stored energy if you keep your mind and body relaxed. It also helps if you do not overwork yourself or expose your body to very hot or cold temperatures.

Once a Chinese seaman drifted 133 days in the Atlantic. He survived on fish and rain water and was able to walk ashore when rescued.

Fish

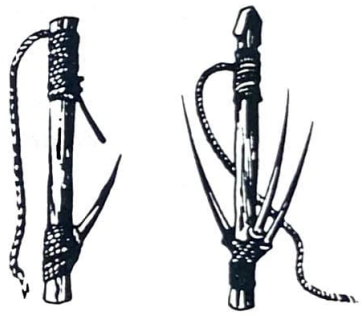
Most fish that are found in the open sea can be eaten. If they are found closer to shore, they might be poisonous. Poisonous fish blow themselves out or have spines or bristles. The puffer, porcupine and parrot fish are poisonous.

The flesh of fish caught in the open sea is good to eat either cooked or raw. Many tribes and some nations commonly eat fish raw and like it. The heart, liver and blood of fish are good to eat. Intestinal walls are edible, but the contents may be dangerous unless they are cooked. The stomachs of large fish may contain small fish partly digested. They are excellent. Fish eyes can be eaten for their moisture content.

You can catch fish by using the fishing kit provided with your equipment. Complete instructions are inside the kit. If you have lost your fishing kit, you could use the following methods to catch fish:

a. If you have a knife, you may be able to stab large fish near the surface or spear them by tying your knife to a paddle, oar or boat hook. Slash with your knife in schools of small fish.

b. Fishhooks can be made from wood split from the lifeboat. This wood is notched and held together with thread from the equipment or unravelled from cloth.



Fishhook
Figure 4-21

Fishhook
Figure 4-22

c. A jackknife can be made into a large fishhook. Wedge the blade open with a piece of wood and tie as shown in Figure 4-22.

d. Flying fish are probably the most available food. Many survivors have lived on them alone. Some may glide into your craft or against it. At night, flying fish (and most other fish) are attracted by light. Shine your light on the side of your white craft or a white cloth, and the flying fish will often glide toward the light and into the boat. Often a bright moon shining on a white object will draw them.

If and when you have caught more fish than you can eat, squeeze or chew out the juice of the flesh and drink it. Fish juice tastes much like the juice of raw oysters or clams. To squeeze it out, cut a piece of fish without bones or skin into fine (tiny) pieces. Wrap it in a cloth with long ends. Have two people twist the ends as tight as possible. The juice will drip out. To chew it out, chew a small piece of fish in you mouth. Suck out the juice and swallow it. Spit out the remaining flesh.

To dry fish, cut it in thin narrow strips, and hang it in the sun. If it is well dried and kept dry, it will often stay good for several days. It may even taste better dried.

Important! Fish that are not cleaned may spoil in half a day. Clean your fish and eat or dry it **immediately**!

Turtles

The whole meat, blood and juice of a turtle are good to eat. There is good meat against the shell under the backbone. Cut through the ribs to get to it. **Caution** - after a turtle's head is cut off, the head may bite and the claws scratch. **Watch out**!

The hot sun will bring a clear oil out of turtle fat. You can dip your food in it.

Seaweed

Raw seaweed is tough and salty. It is difficult to digest. Eat it only if you have plenty of fresh water.

Small edible crabs, shrimp and fish often live in the seaweed. Lift it out of the water slowly and carefully. Shake it over the survival craft. Get rid of the jelly fish and eat the remaining morsels.

Birds

All sea birds can be eaten and are nourishing. Their blood and livers can also be eaten. Three merchant seamen survived 83 days on a raft by catching twenty five or twenty six birds and eating them.

Birds will sometimes land on the survival craft or on your hand or back. Grab them! Birds can be caught by dragging a baited fishhook behind the craft. As they swallow the hook, pull on the line. The hook catches the bird like a fish.

Catch every bird you can. Use the feathers as fishing lures and to help you keep warm. Use the meat and guts for fish bait.

Birds follow schools of fish, so they can show you where fish are. When birds are feeding on a school of fish, they sometimes get so excited that you can get right up to them. Don't forget the fish they are feeding on.

O. Urinate Soon After Boarding

If you did not urinate within a few hours before boarding the survival craft, you should do so within two hours.

The traumatic effects of a disaster at sea may make urination difficult. You could damage your bladder if you do not pass urine. Here are two methods that might help you urinate.

1. Have someone pour seawater slowly back and forth from cup to cup in front of you.

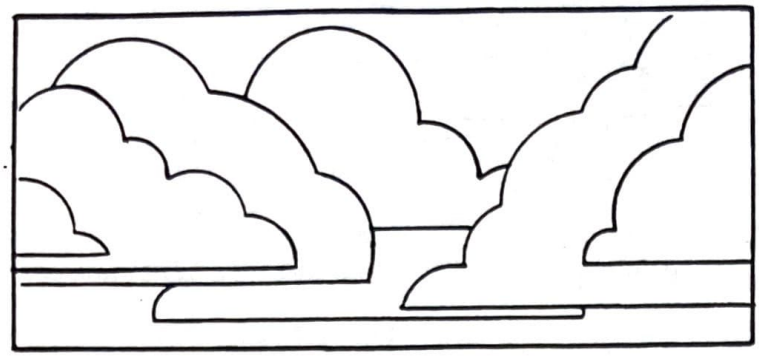
2. Hang over the side with the water waist high. The cool water should help.

After several days with little drinking water, do not be alarmed if your urine appears dark and thick. Such a reaction to dehydration is normal.

P. Looking for Land

One sure sign that land is near is **cumulus clouds.** They form over land when the warm land air rises and cools.

Cumulus clouds are dense white clouds with flat bases and a fluffy appearance. They appear in patches and do not cover the entire sky. (See Figure 4-23.)



Cumulus Clouds
Figure 4-23

Q. Survival Ashore

If you make it ashore where there are no people, you must:

1. Protect yourself from exposure.
2. Attract the attention of rescuers.
3. Obtain water and food.

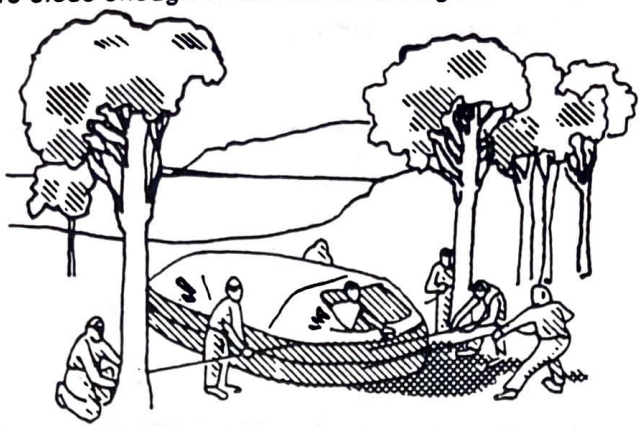
Survival on unfamiliar shores depends a lot on how well you use your head. A great deal has been written on land survival. Since this manual is mainly concerned with water survival, the three priorities will only be briefly discussed. This is not intended to be a comprehensive land survival manual.

Protection From Exposure

There are also dangers from exposure to weather when you are ashore. You must protect yourself from extreme hot and cold weather.

If you come ashore in an inflatable liferaft, you have a ready-made shelter. That is a good reason to get your raft and equipment ashore without damaging it. Carry the raft above the high water level. Remove the CO_2 cylinder, so the raft will rest evenly on the ground. Tie the raft down to trees or rocks, or anchor it in some way. This will keep sudden storms from moving the raft. (See Figure 4-24.)

Don't build a campfire close enough to the raft to damage it with sparks or heat.



Securing Raft on Land
Figure 4-24

In arctic climates, shelter can be made from snow blocks or by digging a cave in the snow. There should be two holes for ventilation (getting air in and out). One can be the entrance and the other higher up.

In tropical climates, shelter can be made from trees and branches.

ATTRACTING ATTENTION OF RESCUERS

Have a pile of dry materials ready to light if a ship or aircraft is spotted. Damp materials give off the most smoke for day signals. Flames are best for night signals.

Make an SOS sign on an open place in large letters at least twelve feet high. The letters can be made from anything that will be easy to see such as rocks, seaweed or dirt trenches. It will be easier for an aircraft to spot very large letters that are made from things that can be seen easily.

If you move your camp, mark a large arrow on the ground in the direction you are moving. Leave a note behind stating when you departed and the reasons why.

OBTAINING FOOD AND WATER

Again, water is more important than food Without water, food will do you no good.

Drinking water might be found along the shore by digging a hole about one hundred yards above the high tide mark. Fresh water will be found first because it is lighter than salt water, so don't dig any deeper than is necessary. Usually, you should dig about a foot deeper after the first water starts to seep through. Scoop the water off the top. It may taste somewhat salty, but it should be safe to drink. If it is too salty tasting, dig another hole somewhere else. Water can also be obtained from streams, lakes, or ponds.

You can get water by melting snow and ice, collecting rain,and eating or draining some types of plants. If you are in doubt about the purity of the water, boil it before drinking.

Food sources include much of the sea food and birds described in the **Water Survival** section. Any animals which can be killed are useful. Many types of wild plant food can be eaten **if you know what to look for.**

Chapter 5
SIGNALING TO ATTRACT ATTENTION

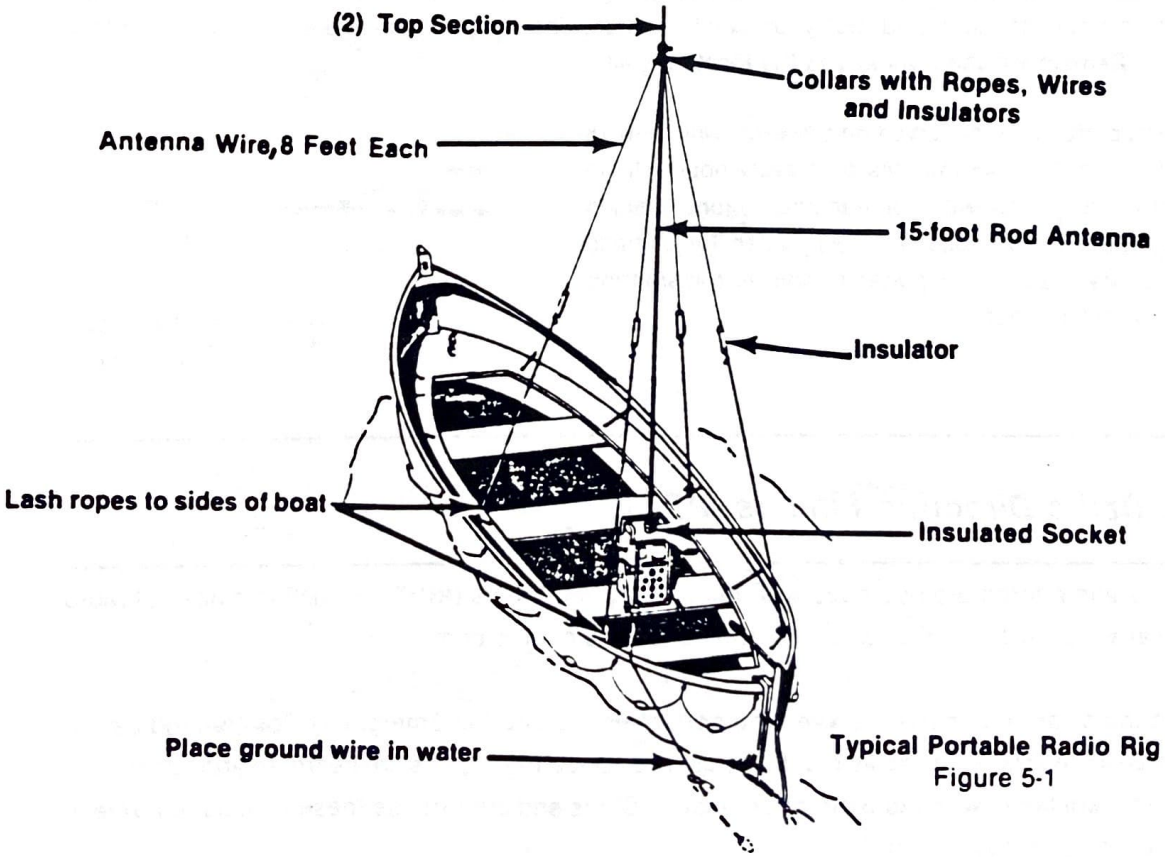
A. Portable Lifeboat Radios

The portable radio set is a very important survival aid. Your chance of a speedy rescue can be increased by knowing how to use a portable radio.

All vessels on an international voyage have a portable radio set. The set is approved by the Federal Communications Commission. If at least one lifeboat on each side of the ship has a permanently installed radio, the ship is not required to have a portable radio.

The portable radio is kept in the chart room, radio room or another location so it can be quickly moved to any lifeboat in an emergency.

There are step-by-step instructions attached to the portable radio. You do not have to be a skilled radio operator to transmit one-way, automatic signals. You cannot use your voice to communicate on the radio. You can only use **morse code** (dots and dashes).



Typical Portable Radio Rig
Figure 5-1

The radio's antenna must be rigged according to the instructions. The instructions will also tell you how to rig the ground wire. You must follow every detail. For example, if you do not trail the ground wire in the water according to the instructions, the radio will not transmit.

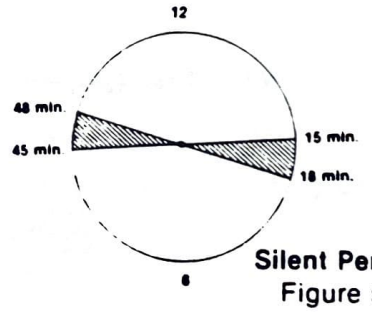
Most portable radios are powered by handcranking a generator which is located inside the radio set. When cranking the emergency radio, make sure it is being cranked in the direction of the arrows at about 65 RPM.

When it is properly set up and working, the portable radio will transmit radiotelegraph signals in either the **manual mode** (you operate a telegraph key) or the **automatic mode** (you set the switch and crank the generator). The radio will send out signals simultaneously (at the same time) on **two frequencies** (bands). The two frequencies are **500kHz** (read as "five hundred kilohertz") and **8364 kHz**. Each frequency has its own signal (message) with its own purpose in helping you be rescued.

The 500 kHz signal is **12 four second dashes** followed by **3 groups of SOS's.** These 12 four second dashes will set off the automatic alarm on the radio equipment on any ship within range of your transmitter if the radio operator of that vessel has his auto alarm circuit turned on. The radio operator aboard each ship is supposed to have that circuit working if he is not on watch. The alarm will tell the ship's crew that there is an emergency signal to listen to. **Remember, the 500 kHz is the auto alarm signal.**

The 8364 kHz signal is **3 groups of SOS s** followed by **a very long (30 seconds) dash.** This long dash gives radio operators on nearby ships a chance to determine the direction from which your lifeboat's radio signal is coming. If a least two different vessels get a fix on the direction of your signal, they can compare notes by radio and plot your exact location. Then the nearest vessel can come to your rescue. **Remember, the 8364 kHz is the locate signal.**

Silent periods are observed on 500 kHz from 15 to 18 minutes and 45 to 48 minutes past every hour. Radio operators on ships will not transmit routine signals during the silent periods. They will listen for distress signals. Make sure your portable radio is transmitting during these periods.



Silent Periods
Figure 5-2

B. Radio Direction Finders (RDF)

Ships and aircraft are equipped with **radio direction finders (RDF).** An RDF is a special radio receiver which will indicate what direction a radio signal is coming from.

It is important that survivors keep the portable radio and the Emergency Position indicating Radio Beacons transmitting as much as possible. Once the signals are heard, bearings (lines of direction) are taken with radio direction finders. Ships and aircraft use these signals to home in on and find your survival craft.

C. Emergency Position Indicating Radio Beacons (EPIRB)

In addition to the portable radio, your ship will have at least one **Emergency Position Indicating Radio Beacon (EPIRB)**. There are different makes of EPIRBs. They all have the following things in common:

1. EPIRB float. They are stowed outside, so they will float free if the ship sinks.

2. They are small, approximately six inches thick and one to three feet long.

3. They transmit signals automatically on two international distress frequencies for military and civilian aircraft. These frequencies are 121.5 and 243 megahertz.

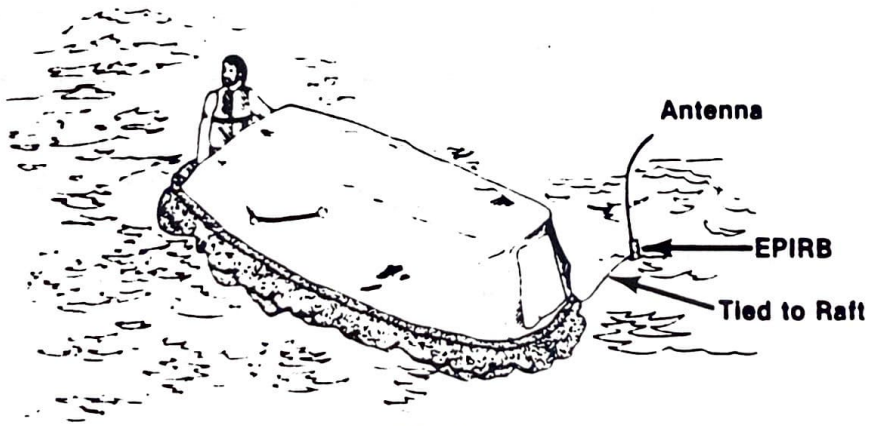
4. Most EPIRB work on **one-way** automatic operation only and cannot be used for two-way communication.

5. They transmit a continuous two tone (hi/lo) signal.

6. Regulations require that the EPIRBs aboard a vessel must be tested and their batteries checked at least **once every month**.

7. Each EPIRB must be clearly marked with the **vessel's name**.

If you are in a survival craft and see an EPIRB floating nearby, catch it and tie it to your craft, so it will not drift away. But remember to leave it in the water so that it will continue to send its messages automatically.



EPIRB
Figure 5-3

D. International Morse Code

The **International Morse code** can be used to communicate with rescuers in a number of ways (see Figure 5-4 below). Some of these ways include the portable radio, lights, sound signals, and markings in the ground.

SOS (. . . - - - . . .) is the most common distress symbol.

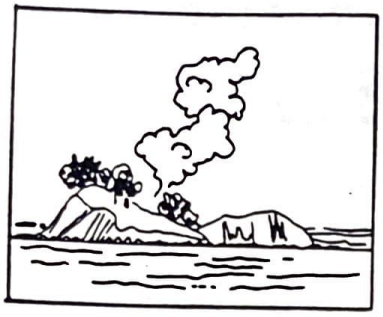
INTERNATIONAL MORSE CODE

Figure 5-4

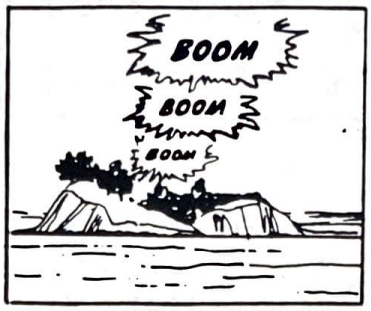
A .-	F . . - .	K -.-	P .--.	U . . -
B -...	G - - .	L .-..	Q - - . -	V . . . -
C -.-.	H	M --	R . - .	W .--
D -..	I . .	N -.	S . . .	X -..-
E .	J .---	O ---	T -	Y -.--
				Z --..
1 .----	3 . . .--	5	7 --...	9 ----.
2 . .---	4 . . . .-	6 -....	8 ---..	0 -----

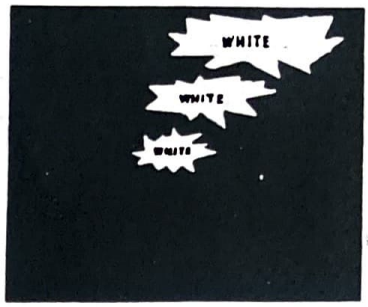
E. Signals to Communicate From Shore

"You Are Seen...Help Will Be Given As Soon As Possible"



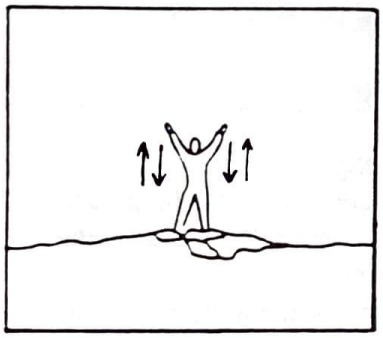
Only by Day
-orange smoke signal



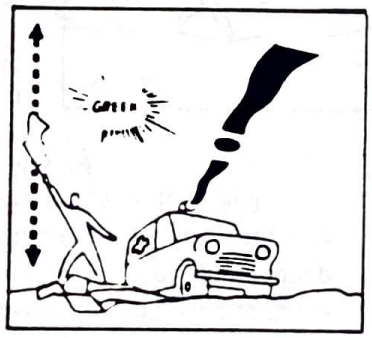


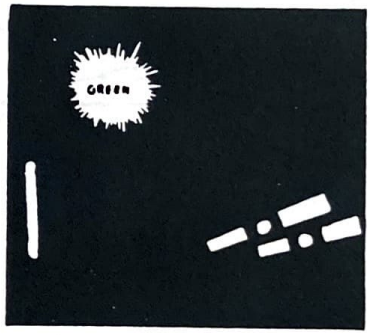
By Day or Night
-3 combined light and sound signals (thunder light) about one minute apart.
-3 white star rockets about one minute apart.

"This Is The Best Place To Land"



Only by Day
-vertical motion of arms

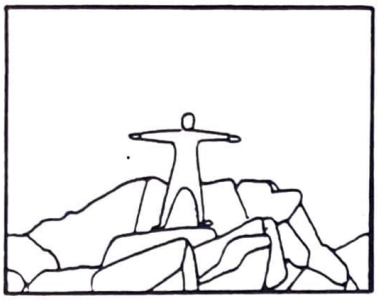


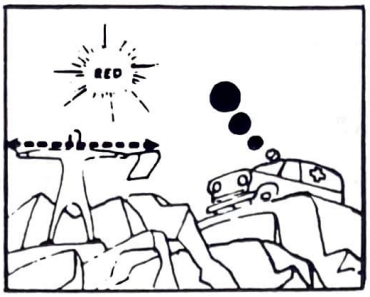


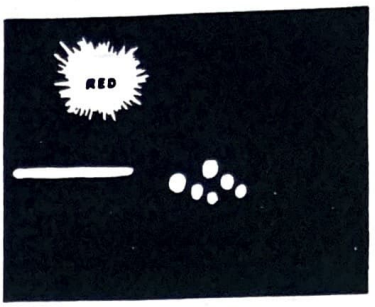
By Day or Night
-vertical motion of white flag or flare.
-firing a green star signal or green flare.
-signalling the code letter K (- . -)
by light or sound.

Note: To help the landing party's approach, place a steady white light or flare ahead of you at a lower level. This will give the landing party reference points, so they can approach you in a direct line.

"Landing Here Is Highly Dangerous"



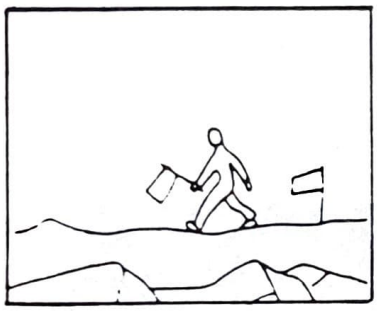


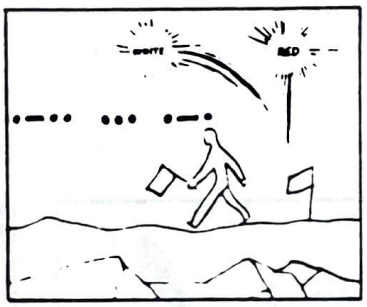


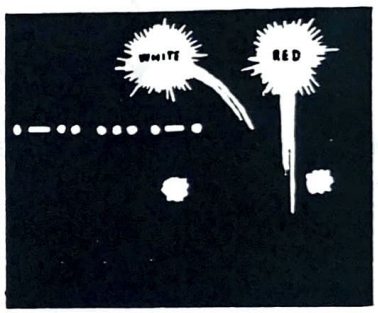
Only By Day
-holding arms horizontally

By Day or Night
-horizontal motion of white flag or flare.
-firing of a red star signal.
-signalling the code letter S (. . .) by sound or light.

"Landing Here Is Highly Dangerous...It Is Better To Land In The Direction Indicated"



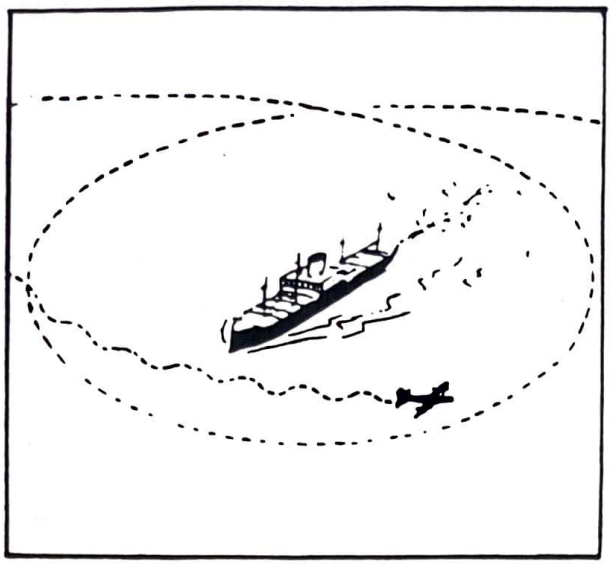




Only by Day
-horizontal motion of a white flag followed by the placing of the white flag in the ground and the carrying of another white flag in the direction of a better landing place.

By Day or Night
-horizontal motion of a white light or flare on the ground and the carrying of another white light or flare in the direction of a better landing place.
-firing of a red star signal vertically and a white star signal in the drection of a better landing place.
-signalling the code letter S (. . .) followed by a code letter R (. -.) if a better landing place for the craft in distress is located to the right of the approaching craft.
-signalling the code letter L (. - . .) if a better landing place is located to the left of the approaching craft.

Notice that "right" and "left" mean as seen by the occupants of the survival craft, not the right and left of the persons on shore sending the message.

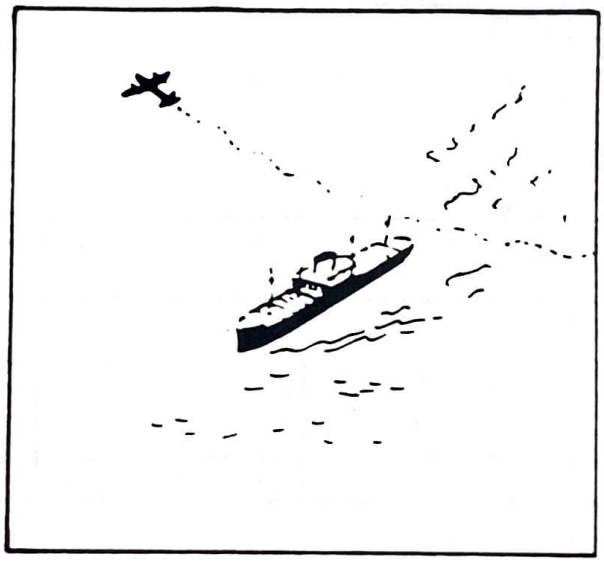


Directing
Figure 5-5

How Aircraft Directs Ship to Persons in Distress

The following procedures performed in order by an aircraft mean that the aircraft is directing a surface craft toward an aircraft or surface craft in distress:

1. circling the surface craft one or more times,
2. crossing the projected course of the surface craft close ahead at a low altitude, opening and closing the throttle or changing the propeller pitch, and
3. heading in the direction in which the surface craft is to go.



Dismissal
Figure 5-6

How Aircraft Dismisses Ship from Rescue Operations

The following procedure performed by an aircraft means that the assistance of the surface craft to which the signal is directed is no longer required:

1. crossing the wake of the surface craft close astern at a low altitude, opening and closing the throttle, or changing the propeller pitch.

TABLE OF LIFESAVING SIGNALS

Signals to be employed in connection with the use of shore lifesaving apparatus

	MANUAL SIGNALS	LIGHT SIGNALS	OTHER SIGNALS	SIGNIFICATION
Day signals	Vertical motion of a white flag or of the arms	or firing of a green star signal		In general: affirmative Specifically:rocket line is held- tail block is made fast- hawser is made fast- man is in the breeches buoy- haul away
Night signals	Vertical motion of a white light or flare	or firing of a green star signal		
Day signals	Horizontal motion of a white flag or of the arms extended horizontally	or firing of a red star signal		In general: negative Specifically:slack away -avast hauling
Night signals	Horizontal motion of a white light or flare	or firing of a red star signal		

Replies from lifesaving stations or maritime rescue units to distress signals made by a ship or person

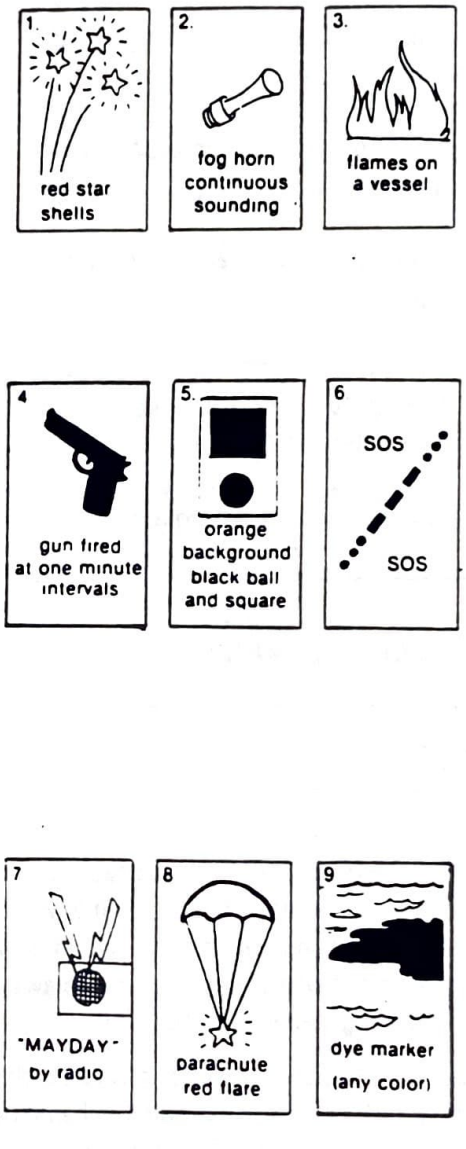
Day signals		Orange smoke signal	or combined *light* and *sound* signal (thunder-light) consisting of 3 single signals which ae fired at intervals of approximately one minute	You are seen- assistance will be given as soon as possible

F. International Distress Signals

A vessel or seaplane that is in distress can use the following distress signals to tell other vessels or people ashore that help is needed. The vessel in distress may use more than one distress signal.

The distress signals are from the International Regulations for Preventing Collisions at Sea. The signals are recognized by all maritime nations.

1. Firing of rockets or shells which throw red stars once every minute.
2. Constant sounding of any fog signal apparatus.
3. Creating flames on the vessel (burning a tar barrel, oil barrel, etc.).
4. Firing of a gun or other explosive once every minute.
5. Flying a piece of orange colored canvas with either a black square and circle or other appropriate symbol for indentification from the air.
6. Signalling of . . . - - - . . . (SOS) in the morse code by radio telegraphy or some other method.
7. Speaking the words "May Day" by radiotelephone.
8. Firing a rocket parachute flare with a red light.
9. Setting a dye marker of any color.



International Distress Signals
Signals — Figure 5-7

10. Hoisting the international signal flags which indicate November Charlie. November is a white and blue checkered flag, and Charlie is horizontal stripes of blue, white, red, white, blue.

11. Hoisting a square flag with a ball, or something that looks like a ball, above or below it.

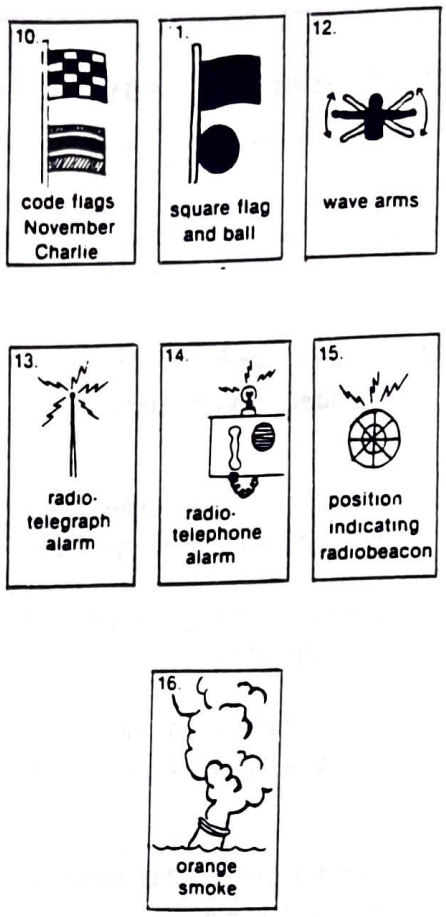
12. Standing on deck with arms outstretched to each side, slowly and repeatedly raising and lowering arms.

13. Sending the radiotelegraph alarm signal.

14. Sending the radiotelephone alarm signal.

15. Transmitting SOS signals by an Emergency Position Indicating Radio Beacon (EPIRB).

16. Igniting an orange smoke signal.



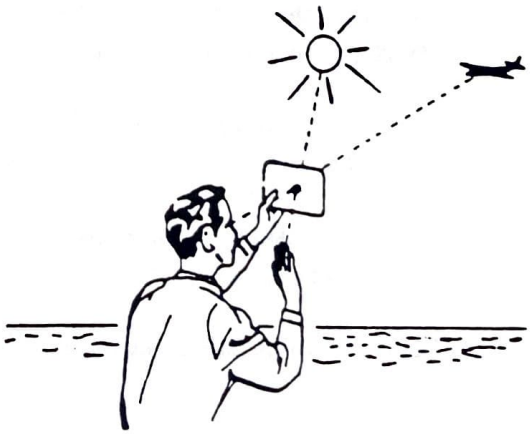
International Distress Signals
Figure 5-7

G. Signaling Devices

Signaling Mirrors

Carefully read the instructions which come with the signaling mirror in your survival equipment. The peephone and double mirror surface allows you to aim the sun's reflection on a bright day with the accuracy of a gunsight into the cabin of a airplane or the bridge of a ship several miles away. Practice this aiming technique ahead of time.

Don't wait until you see a rescue craft to use the signaling mirror. When the sun is shining, flash the mirror all around the horizon. An aircraft can spot the flash long before you would see the aircraft. The signaling mirror may save your life. Use it as long as the sun is shining.



Signalling Mirror
Figure 5-8

Whistles

In calm weather, your voice can be heard only a few hundred yards away. If you keep screaming, you will become hoarse and lose your voice.

A whistle, on the other hand, can be heard up to four miles away in favorable weather conditions. It can come in handy when you are floating in the water trying to attract the attention of nearby rescuers. A whistle can be used over and over again. It can be used in fog, at night or during the day.

Pyrotechnics

Pyrotechnics are signals such as rockets, flares and smoke. Instructions for operating various brands of pyrotechnics are written by the manufacturers, so they are different. Once you are settled in your survival craft, read the instructions on each type of pyrotechnic. Then you'll know how to use them when a ship or aircraft is spotted. Keep the pyrotechnics close by for immediate use, so you can signal when necessary.

Be sure to fire the signals downwind on the lee side of the survival craft. Pyrotechnics have burning particles which may fall down. They may burn you or damage the liferaft. Hold them at a slight angle over the water.

Use smoke signals only during the daytime. Smoke does not glow in the dark. Use pyrotechnics only when you can see a ship or plane. Do not waste them!

Red rocket parachute flares should be used when a vessel is spotted far away on the horizon. A red rocket parachute flare will get the signal up high where it can be seen from a greater distance.

On the other hand, use a hand flare when aircraft is spotted. An aircraft directly overhead would be more likely to spot a hand flare than a flare covered with a parachute.

Chapter 6
BEING RESCUED

A. Rescued At Last!

Once you have been spotted, the ordeal is not necessarily over. There are still problems to overcome.

An aircraft may spot your survival craft and report your position to the Coast Guard. **Remember,** it may be some time before a helicopter or ship can get to you. You will need to continue to ration food and water!

The rescue operation itself can be a dangerous experience. Great caution should be taken.

You may need enough strength to climb a ladder or pull yourself up to a rescue craft. Save your strength and don't swim unless it is necessary.

Step off your survival craft onto the rescue craft **only when the survival craft is on the crest or top of a swell.** This will drop your survival craft down while you are climbing up a ladder or net. Otherwise, there is the danger of your boat or raft being raised up by the wave and hitting you.

B. Helicopter Hoist Procedures

The wind developed by the helicopter rotor system can be over seventy knots. That is why it is important to have all loose gear on deck securely tied down or stowed below decks. The rotor system could be destroyed if any loose objects are blown into the rotor during the hoist.

Your voice cannot be heard over the noise made by the helicopter engine, so it is important to plan ahead. Work out problems which may occur before the helicopter hovers overhead.

Don't forget to wear your life jacket!

There are five ways a Coast Guard helicopter might be used to rescue survivors or evacuate injured mariners:

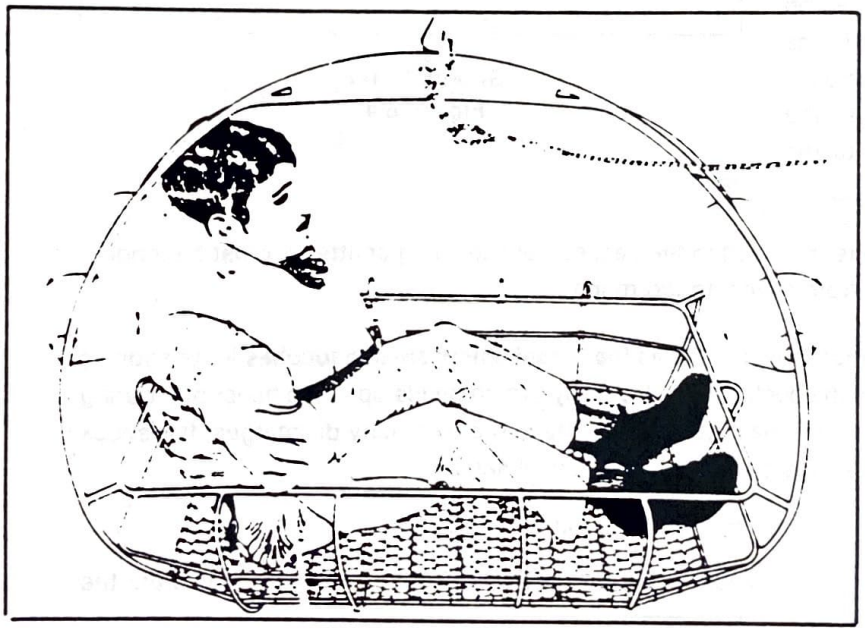
1. Rescue basket
2. Rescue sling
3. Stokes litter
4. Water landing
5. Ship landing

Rescue Basket

The U.S. Coast Guard usually uses a rescue basket for survivors who can help themselves. Unless there is an emergency, only one person at a time gets in the basket. The basket is very easy to use. Just climb into the basket after it touches the deck of the ship or the water alongside your raft or boat. **The pilot will touch the basket down first to discharge static electricity.** Sit down and keep your hands and arms inside (see Figures 6-1 and 6-2). Each basket has a small card of user instructions on it, but it is best to know how to use the basket ahead of time. In an emergency there will be little time to read the card.

Rescue Basket
Figure 6-1

A twin-turbine HH-3F amphibious helicopter, equipped with navigation computer, demonstrates a basket rescue with its external hoist. Built by Sikorksy to Coast Guard specifications, it has two 1,500 h.p. gas tunbine engines, a top speed of 157 mph and a range of 700 miles.



Rescue Basket Hoist
Figure 6-2

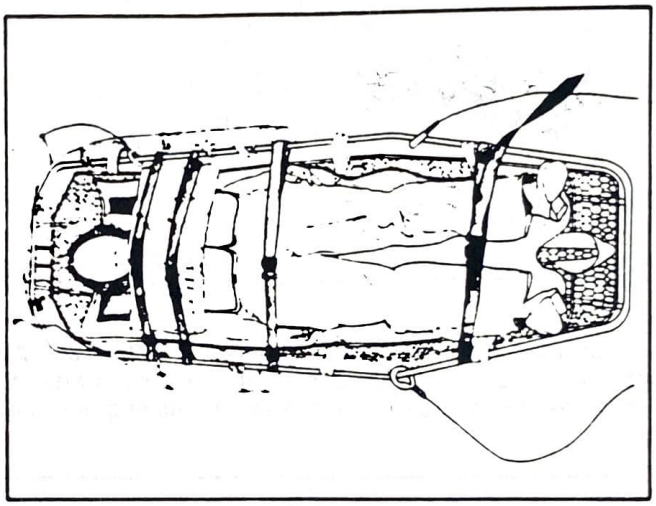
Rescue Sling

A rescue sling is carried on board helicopters. It is used by rescue helos from other countries more often than it is used by the U.S. Coast Guard. The rescue sling is just a padded loop which is placed over the body and underneath the armpits. The arms are held around the sling as shown in Figure 6-3.

Rescue Sling
Figure 6-3

Stokes Litter

A litter will usually be used to hoist those who have serious injuries or illnesses or who are unable to walk. To use the litter it is necessary to get help from other crew members. The straps must be disconnected and spread out, and the blankets must be removed. The patient should be put in and covered with the blankets. The straps are then snugly fastened with the pad on top of the chest (See Figure 6-4).



Stokes Litter
Figure 6-4

If the litter has to be taken below decks to the patient, it must be unhooked from the cable. **The cable hook must not be attached to any part of the vessel.** There is always a possibility that there may be an emergency aboard the helo itself. The helo may have to move unexpectedly. To decrease this type of danger, the pilot may hover off to one side of the vessel while waiting.

Use caution! If a steadying line is attached to the basket, rescue sling or litter, it must be tended. This will stop the rescue device from swinging too much.

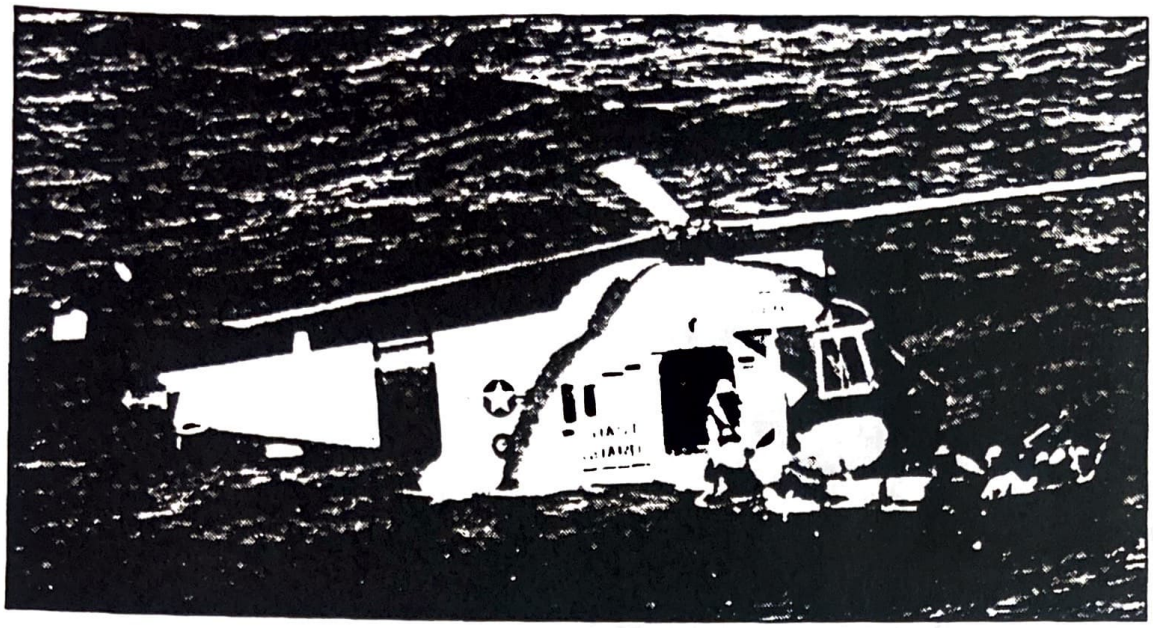
It is very important that the rescue device touches the vessel before anyone touches it. As soon as the object being lowered touches the deck, **static electricity** (which builds up in the helicopter during flight) will be discharged. If you touch the object before the static electricity discharges, the shock could make you let go with a hand you are using for personal safety.

Never shine lights on the helicopter! It will blind the pilot.

To signal the helicopter that all is ready for hoisting, give him a **thumbs-up signal.** If you are the patient, nod your head if you are able.

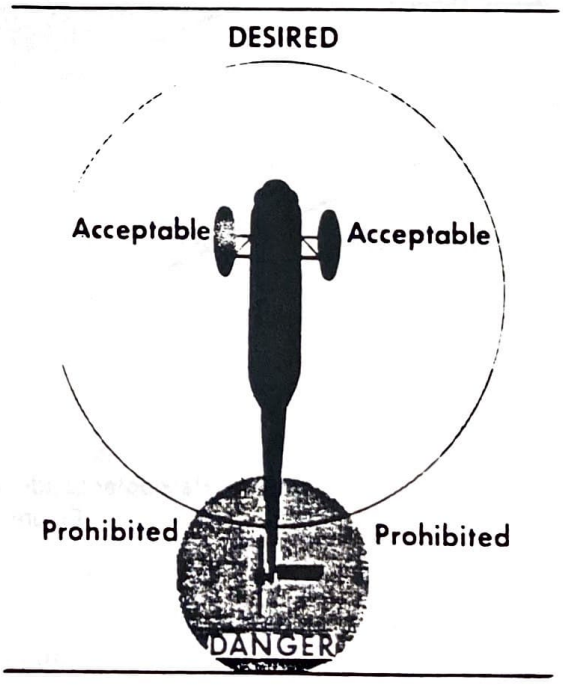
Water Landing

U.S. Coast Guard helicopters are amphibious (able to land on water or land). If the seas are not too rough, rescues may be made by landing on the sea.



Water Rescue
Figure 5
An HH-52A amphibious helicopter picks up survivors.

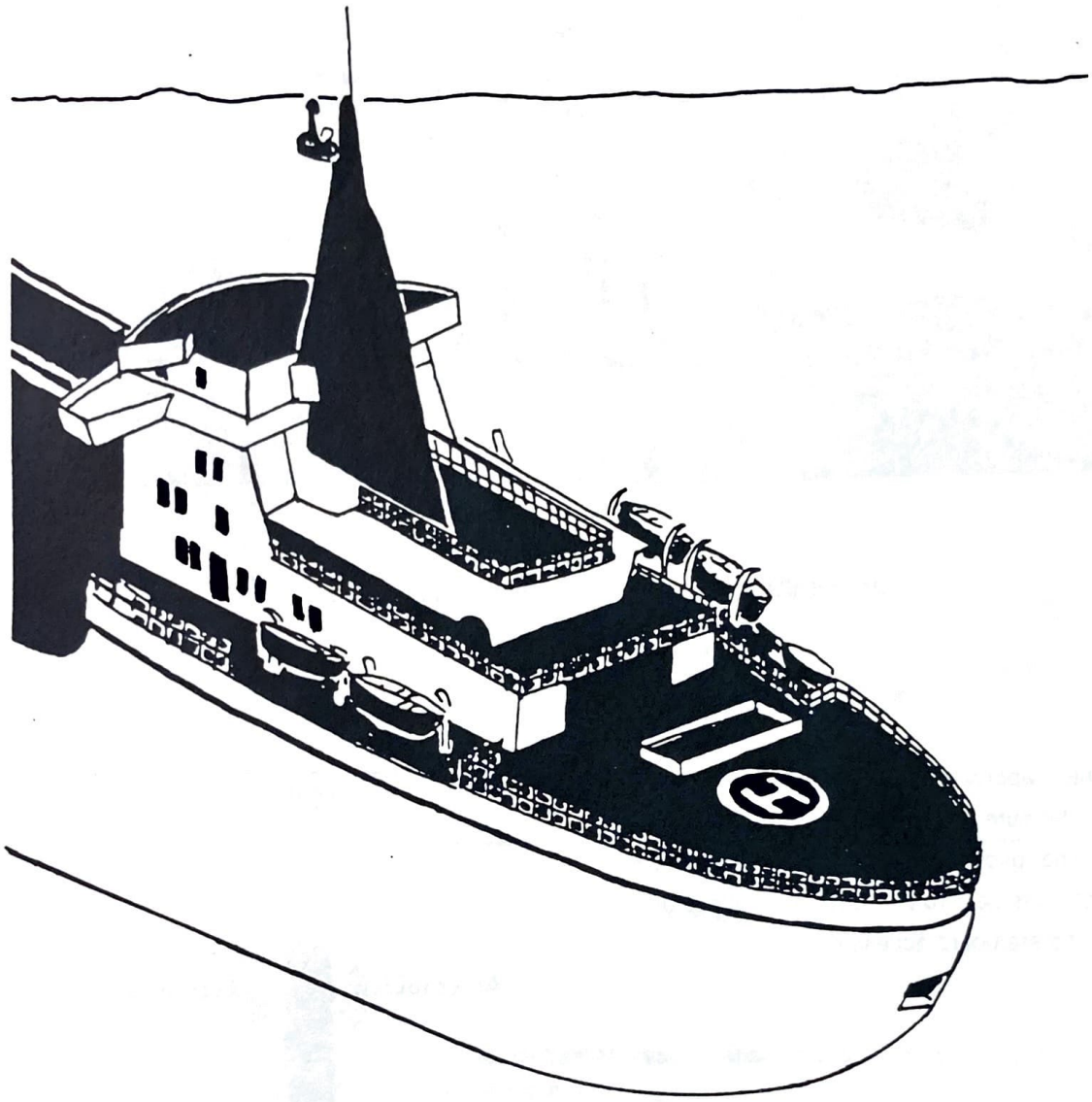
When approaching a helicopter in the water, be sure that the helicopter crew sees you. The pilot cannot see all around his aircraft. It is best to approach from ahead or from the starboard access door.



Chopper Safety Zone
Figure 6-6

Ship Landing

Some very large merchant ships have a helicopter landing area on deck. The helicopter actually lands on the deck of the ship. A large H marks the landing area on the fantail of a tanker. (See Figure 6-7.)



Helicopter Landing Pad on Deck
Figure 6-7

Hoist Operations

1. If it is possible, move the patient as close to the hoist area as you can. **Remember, time is important!**

2. If a litter is required, it will be necessary to move the patient to the special litter that is lowered by the helicopter. Be prepared to do this as quickly as possible.

3. When the patient has been put in the helicopter's litter, be sure he is strapped in, face up, with his life jacket on, if his condition permits.

4. Be sure that the patient is tagged to indicate what medication, if any, was given to him and when it was given.

5. Have the patient's medical records and any necessary papers in an envelope or package ready to be transferred with him.

6. The ship's course should be changed so the ship rides as easily as possible with the wind about **30° on the bow** (preferably the port bow). The course should keep the stack gases clear of the hoist area. Once the course is established, it should be maintained.

7. If necessary, the ship's speed should be reduced to ease its motion. However, enough forward speed should be maintained so that the ship will respond to the helmsman. Once the speed is established, it should also be maintained.

8. If you do not have radio contact when you are ready to begin the hoist operation, signal the helicopter in with a "come on" signal by hand. If the hoist is at night, use a flashlight to signal "come on".

9. **To avoid static shock**, allow the basket or litter to touch the deck before handling it!

10. If a steadying line is dropped by the helicopter, guide the basket or litter to the deck with it. Keep the line clear at all times.

11. Place the patient in the basket, sitting with hands clear of sides, or in the litter as described before. Signal the hoist operator when you are ready for the hoist. The patient can signal by nodding his head if he is able, or the deck personnel can give the "thumbs up" signal.

12. If it is necessary to take the litter away from the hoist area, unhook the hoist cable and keep it free so the helicopter can haul it in. **Do not secure the hoist cable to the ship or try to move the litter without unhooking it!**

13. When the patient is strapped in the litter, signal the helicopter to lower the hoist cable; hook it up and signal the hoist operator when the litter is ready to lift.

14. If there is a steadying line attached, use it to keep the basket or litter from turning or swinging. Keep your feet clear of this line.

C. Medical Evacuation

Occasionally, helicopters are used to evacuate (remove) ill or injured crew members from a ship at sea to take them to a hospital. The ship's master has a complete check-off list to get the ship and crew ready for the meeting with the helicopter.

The following is a complete Helicopter Evacuation Check-off List:

Requesting Helicopter Assistance:

1. Give the ship's accurate position, its speed and course, the time, weather conditions, wind direction and velocity, voice and cw (continuous wave) frequencies.

2. Give complete medical information on the victim, including whether or not he is ambulatory.

3. If the ship is beyond the helicopter's range, tell the rescuers where the ship is going so that a meeting point can be arranged.

4. Advise the rescuers of any other changes **immediately.** If the patient dies before the helicopter arrives, notify them as soon as possible. Remember, the helicopter crew are risking their lives to help you.

Preparations Prior to Arrival of the Helicopter

1. Provide continuous radio guard on 2182 kHz or the specified voice frequency if possible. The helicopter cannot operate on a cw frequency.

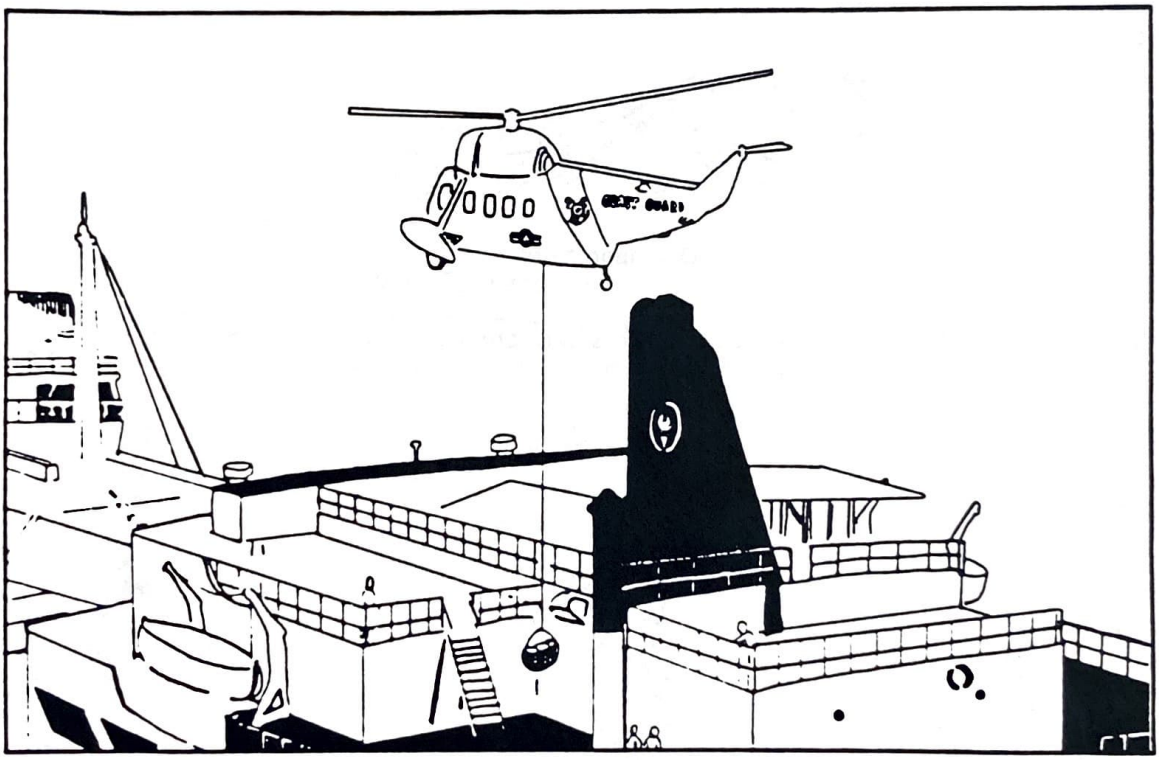
2. Select and clear a hoist area. The hoist area should be aft if possible and have a minimum fifty foot radius. Any loose gear, awnings, and antenna wires should be secured. Trice up running rigging and booms. If the hoist area is aft, lower the flagstaff. If possible, fly flags, but not near the hoist area. Flags will provide the helicopter pilot with a visual reference as to the direction and force of the apparent wind. If at night, shine a light on the flag so the pilot can see it.

3. If the hoist is at night, light the lift area as well as possible. **Do not shine any lights on the helicopter,** so the pilot won't be blinded. If there are any obstructions in the hoist area, light them so the pilot can see them.

4. Point searchlights at a vertical angle to help the pilot locate the ship. Secure them when the helicopter arrives.

5. Be sure to tell the pilot the location of the hoist area **before** the helicopter arrives so that he can plan his approach.

6. Arrange a set of hand signals among the crew that will help you with the lift. Because the helicopter's noise level will be very high, you will not be able to hear voice commands.



Medical Evacuation
Figure 6-8

Shown during a rescue mission, this HH-52A amphibious helicopter lifts an injured seaman from the stern of the American vessel *Overseas Rebecca* for medical evacuation to the nearest shore hospital.

APPENDIX A

Lifeboat Marlinespike Seamanship

Marlinespike seamanship is a general term that covers all phases of rope work. It is of great importance to every seaman since many forms of rope are used constantly aboard ship. The safety of a lifeboat and its crew frequently depends on the marlinespike seamanship skills that have been mastered by the boat crew.

All lifeboatmen must know the following basic knots and their proper uses. You should be able to tie these important knots in the dark.

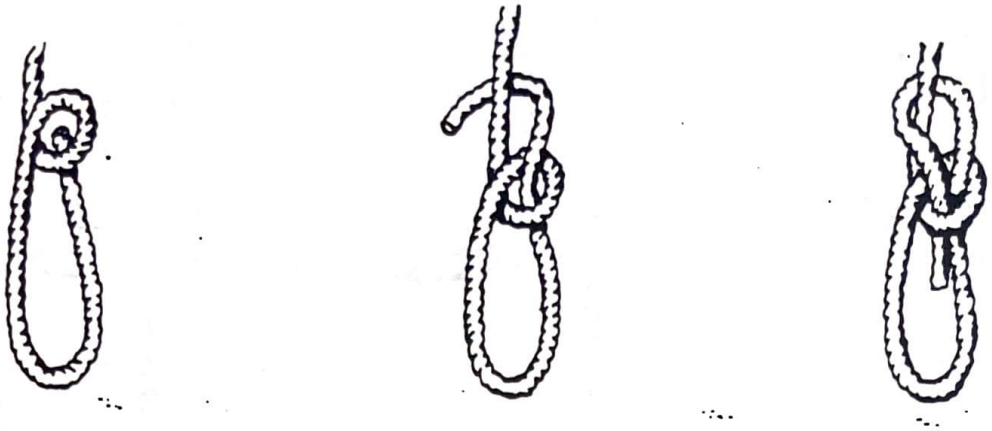
The following illustrations and descriptions are of the most widely known and useful knots for the lifeboatman.

Overhand Knot

The overhand knot is the simplest of all knots and forms a part of many other knots.

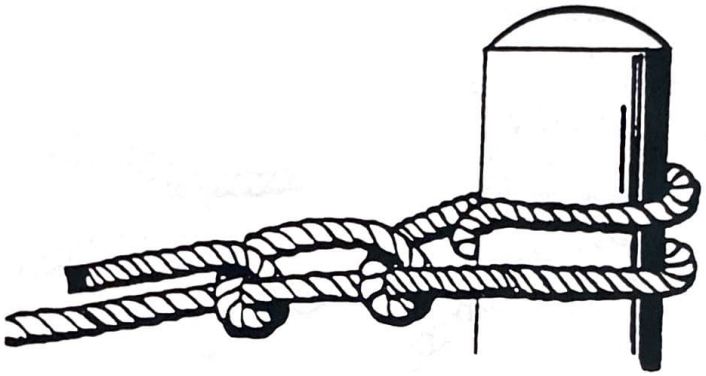
Figure-Eight Knot

The figure-eight knot is a simple knot that is used like the overhand knot, but it can be untied more easily. Both the overhand knot and the figure-eight knot are used to keep the end of a line from fraying or unlaying. Either one can also be used as a stopper knot to keep the end of a line from being pulled through a block or hole.



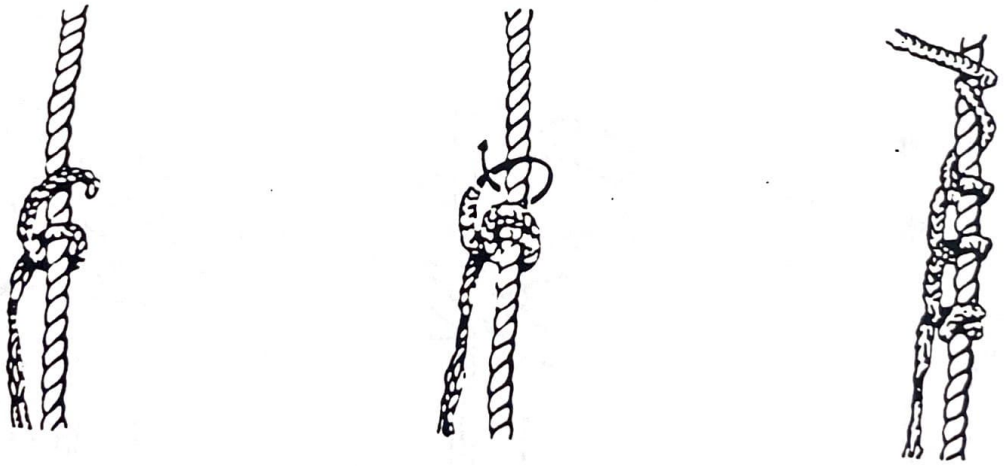
Bowline Knot

The bowline is the best known and most useful knot for putting a temporary eye in the end of a line. It will not slip or jam and will not untie easily.



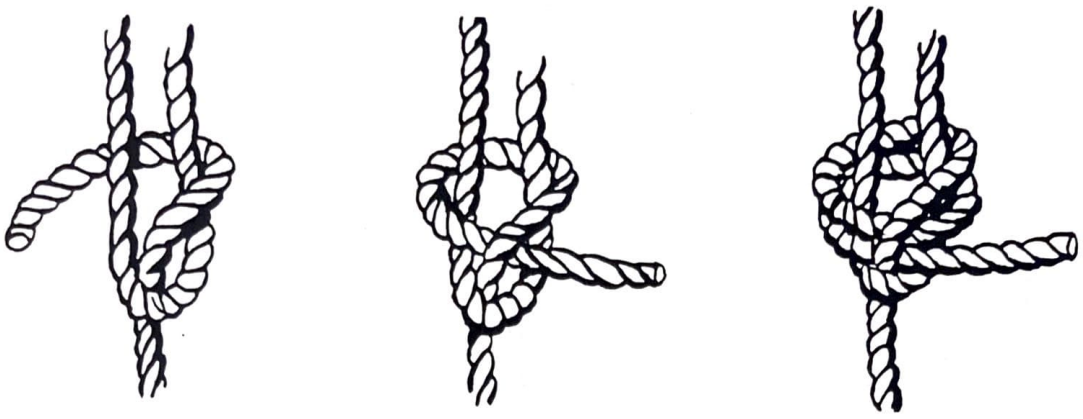
Round Turn and Two Half Hitches

The round turn and two half hitches is used to make a boat fast to a spar or bitt. It is also used to secure a line to a ring, shackle or anchor. It is better than two half hitches alone or the clove hitch.



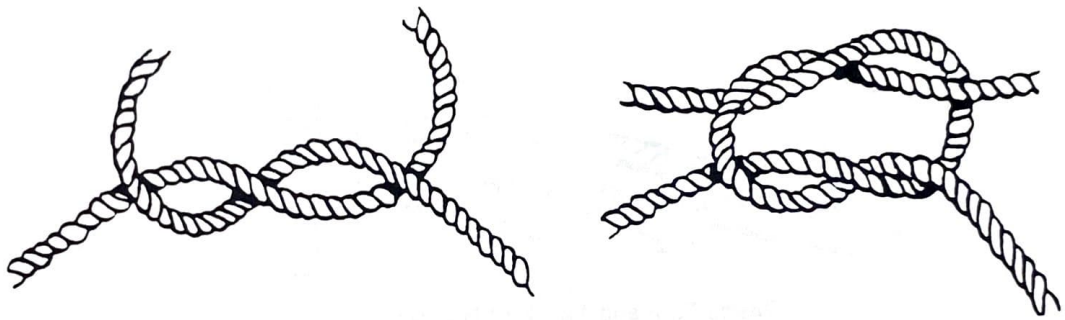
Stopper Hitch

The stopper hitch is used to take the strain off the lifeboat falls or other lines in order to transfer them from a source of power (either a winch or manpower) to a bitt or cleat. When this hitch is required, the term used is "passing a stopper."



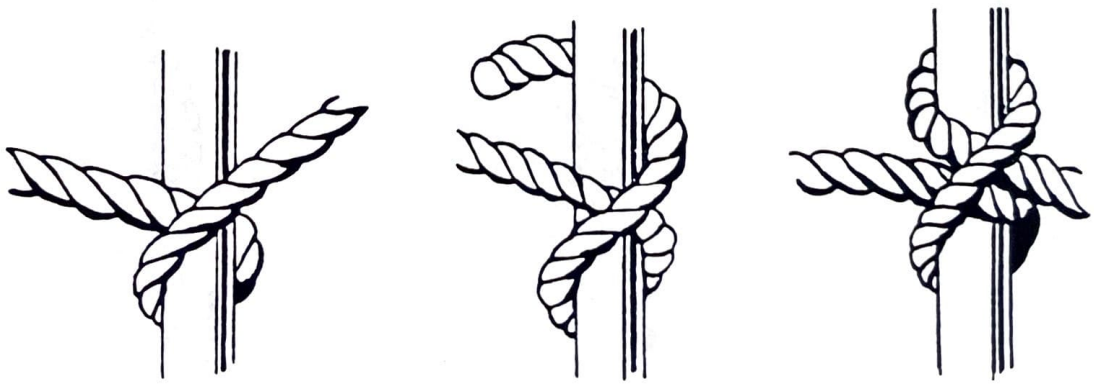
Becket Bend

The becket bend (or sheet bend) is used to tie together two lines of different sizes. The double becket bend is always used to bend a gantline (a line used to haul yourself aloft) onto a boatswain's chair.



Square Knot

The square knot is used to bend together two lines of the same size. A square knot is a useful knot that will not slip.



Clove Hitch

The clove hitch is used to make a line fast to a spar or post. It will not jam and can be untied easily.

APPENDIX B

Lifeboat Glossary

abaft—at or toward the stern; may also mean behind.

aft—toward or near the stern.

aftermost—nearest to the stern.

air tanks—tanks filled with air; used as buoyancy units in lifeboats and located under the sidebenches.

amidships—the area that is halfway or midway between the bow and the stern.

antenna—the rod attached to the top of the portable radio; its purpose is to transmit radio signals to nearby ships so that they can locate the lifeboat and render assistance.

apex—the pointed end (tip) of the sea anchor through which the storm oil is released.

athwartship—across the ship in a side-to-side direction.

auto alarm signal—twelve four second dashes followed by three SOS groups transmitted on 500 kHz radio frequency; this signal should set off an alarm on any ship within radio range and tell the ship's radio operator to tune to 8364 kHz and use that signal to fix the direction of the emergency signal.

automatic closing valve—the rubber ball in the cage of the boat drain.

backbone of the lifeboat—the heavy metal bar along the bottom of the lifeboat and its extension at each end of the boat; namely, the keel, the stem, and the sternpost.

back float—a way of staying afloat without a life jacket by lying on your back with your head out of water, arms and legs relaxed.

bailer—flexible container used to get water out of the boat.

"Backwater all"—the command by the coxwain for everybody to row astern. This backs the boat astern. The command **"Backwater port"** may be combined with **"Give way starboard"** to turn the boat rapidly to port. The command **"Backwater starboard"** may be combined with **"Give way port"** to turn the boat rapidly to starboard.

ballast—anything used to stablize a boat; may also mean to stablize the boat.

ballast bags (water pockets)—bags under the liferaft which automatically fill with sea water; this stablizes the raft and slows its windward drift.

beam—the side of the boat; also the direction that is at 90° (right angle) to the keel.

bilge pump—a mechanically or manually operated device used to get water out of the boat.

bilge strake—the middle row of metal plating where the sides turn in toward the bottom of the lifeboat.

block—a pulley; the grooved wheel inside a block is the sheave.

boathook—a wooden pole tipped with a metal ballpoint and hook. It is used for fending off or for hooking falls or lines when coming alongside.

bottom boards (footings)—wooden boards running lengthwise in the bottom of a lifeboat; they rest upon (and are fastened to) the athwartship metal ribs called the floors.

bow—the forward area of the boat.

bow sheets—the seating area furthest forward in a lifeboat.

brackets—metal braces holding the sidebenches and thwarts to the gunwale.

brake release lever—used by the winch/brake operator to lower a lifeboat in a roller gravity davit.

broaching (turning broadside)—when a boat turns or swings sideways to the wind and waves; broaching is very dangerous because it increases the chance of capsizing.

broad on the beam—looking over the side of the boat at about a 90° to the keel. The terms usually used are "Broad on the port beam," or "Broad on the starboard beam."

broad on the bow—a direction over either bow along an angle of about 45° to the keel. Ther terms usually used are "Broad on the port bow" or "Broad on the starboard bow," depending upon which side is being mentioned.

broad on the quarter—looking astern in the boat at about a 45° angle to the keel on either side. The terms usually used are "Broad on the port quarter" or "Broad on the starboard quarter."

bunk—the place you sleep on board the ship.

buoyancy—the ability to stay afloat in the water.

buoyancy tubes—the big, gas filled tubes around the outside of the liferaft. The buoyancy tubes provide the floatation to keep the liferaft afloat.

buoyancy unit—material placed under the sidebenches; used to stabilize and keep the boat afloat. May be either unicellular plastic foam or air tanks.

canopy—the covering of the liferaft.

capsize—to turn over a boat or raft all the way over in the water.

catchment tube assembly—located on the liferaft canopy and used to catch rain water.

centerline—the exact lengthwise center of the lifeboat.

clew—the lower aft corner of the sail. The clew has extra sail fabric sewed on it for reinforcement and it has a large grommet (eyelet) through which you can tie the sheet. (See entry for sheet in glossary.)

CO_2 (carbon dioxide)—the gas used to inflate the liferaft.

compass deviation—error in the compass reading caused by the presence of metal objects near the compass or by the iron in boat or vessel itself. The amount of deviation tends to vary as the boat is turned in different compass headings.

compass error—the combined effects of both variation and deviation. Compass error is the number of degrees difference between where the compass card indicates that True North **should be** and where it **really is** when you adjust for both deviation and for variation.

compass variation—error in the compass reading caused by the difference in location between the Magnetic North pole and the True (Geographic) North Pole.

condensed milk—milk prepared by evaporating much of its water content and then canning the thick, creamy substance left as residue. Lifeboats are provided with one pound of condensed milk per person per capacity of the boat.

coxswain (lifeboatman-in-charge)—the person who steers the lifeboat and gives the commands.

cradle—the wood or metal fittings on which the lifeboat rests while it is stowed in the davit.

crest—the top of a wave or ocean swell.

cumulus clouds—dense white clouds with flat bases and a fluffy appearance; usually found around land.

davit—the equipment used to lower and hoist the lifeboat.

davit span—the wire between the two davit arms from which the manropes are hung.

dead ahead—directly ahead of the boat or the vessel in a line with its keel.

dead astern—directly behind the boat or the vessel in a line with its keel.

desalting kit—any of a variety of solar stills or chemical additive kits by which it is possible to transform salt sea water into distilled or drinkable water. If a survival craft is equipped with a desalting kit, the occupants will be provided with one-third less drinking water. On a lifeboat this means only two quarts per person instead of three. On a liferaft this means one quart per person instead of a quart and a half.

dismissal—permission to leave from duty or drill.

ditty bag—a canvas bag containing a sailmaker's palm, needles, sail twine, marline, and a marlinespike are provided on each lifeboat. This is a heavy duty sewing kit for repairing the canvas sail or the protective cover or for improvising a replacement drogue, etc.

double-ended—pointed at each end.

doubler plating—protective metal siding on the lifeboat shell where it rests in the cradle.

drain—a hole in the bottom of the boat through which water drains out when the boat is lifted out of the water; when the boat is afloat in the sea, the automatic closing valve and/or the drain cap prevents water from flowing through the drain back up into the boat.

drogue (sea anchor)—a cone-shaped, canvas device used to head the boat into the wind, limit drifting, and spread storm oil.

electrolysis (electrolytic corrosion)—the rapid wasting away of metal that takes place when two different metals are in contact with each other and sea water.

embarkation deck—the deck from which passengers and crew enter the lifeboat.

emergency disconnect switch—a safety switch which will shut off power to the winch.

emergency position indicating radio beacon (EPIRB)—a special radio transmitter designed to float off of a sinking ship and automatically begin to send a distress signal which will both alert authorities to your situation and help them locate you

end-for-end—done to manila or fiber rope falls every year. The end exposed to the weather is reversed with the protected end.

falls—wire or fiber ropes secured to the davit and used to hoist and lower the lifeboat.

fall blocks—traveling blocks with sheaves (pulleys) through which the falls pass as the lifeboat is lowered or raised in the davits. The fall blocks go up and down with the boat, but remain on the falls after the Rottmer hooks are opened and slip out of the fall block hook rings.

fathom—a measure for water depth one fathom equals six feet.

Fleming gear—the equipment in some lifeboats which moves the lifeboat through the water when the crew pushes and pulls the propelling levers fore and aft. This moves a bar which turns gears and a propeller shaft and a propeller. The gear includes a stern tube and a stern gland and a forward or reverse gear box. A lifeboat equipped with Fleming gear is also said to have a hand-propelled system.

floating sheath knife—a special hookshaped knife blade is sharp only on the inside edge; this makes it unlikely to accidently puncture the buoyancy tubes of the liferaft. It is stowed in an outside pocket of the canopy near the forward entrance.

floors—athwartship metal ribs in the bottom of the boat upon which the bottom boards are placed; floors form compartments in the bilge of the boat through which limber holes allow water to reach the boat drain.

footings—see **bottom boards.**

foot—the bottom edge of the sail.

footrests (stretchers)—places for rowers to brace their feet while rowing.

fore—at, in, or toward the front part of a ship or boat.

fore and aft—lengthwise direction from bow to stern.

forestay—a galvanized wire rope of not less than 3/16 inches diameter which runs from the top of the mast to the bow shackle; its purpose is to support the mast.

frapping lines—fiber ropes passed around the falls; used to keep the lifeboat from swinging as it is lowered or raised.

garboard strake—bottom row of plating next to the keel of the lifeboat.

"Give way together"—the normal command (after "oars out") for the crew to begin rowing the boat in a forward direction.

grabline—knotted manila rope two inches in circumference and passed from gunwale to gunwale under the keel. required if there are no grab rails.

grab rails—metal bars located near the turn of the bilge on both outsides of the lifeboat and used when the boat capsizes.

gravity davits—the newest and third major type of davits for launching lifeboats. Three common gravity davits are the single pivot gravity, the Miranda (MIR) gravity, and the roller gravity. Gravity davits require no energy input to launch their lifeboats; you simply take off the gripes and locking bars and release the brakes-gravity itself does the work of putting the boat over the side of the vessel. If need be, a single person can get away a lifeboat in a gravity davit. Gravity davits always have winches, therefore, they always have wire falls.

gripes—wire ropes used to secure the lifeboat in its cradle; the gripes are adjusted by turnbuckles.

ground wire—an electrical wire which must be trailed in the water when the radio is transmitting.

gudgeons—metal fittings on the stern-post into which the rudder's pintles are placed when the rudder is installed for use; the gudgeons and pintles together create a hinge upon which the rudder can swing for steering purposes.

gunwale—the wood or metal edges on the top of the sides of the boat that run the length of the boat between the stem and stern post. (pronounced "Gunnell.")

halyard—a line used to hoist the yard and its attached sail up the mast. A halyard generally is any line running through a block and sheave at the top of a mast; halyards raise yards, sails, and even flags and eluminating lanterns up the mast. When the sails or flags are in position, the halyard can be tied off on a cleat near the base of the mast.

head—top edge of the sail. In the standing lug rig, the head of the sail is laced to the yard.

heave to—putting the boat head to wind and stopping.

heaving line—a 60 feet fiber rope of one inch circumference which can be heaved to persons in other craft, in the water, or on a dock; the heaving line can also be used for general purposes, such as lengthening the drogue's tripping line, etc. The heaving line for a liferaft is smaller circumference but is 100 feet long.

H.E.L.P. position (Heat Escape Lessening Posture)—a position for holding in body heat while in cold water.

hoist—to raise or lift.

hoist button—see winch raise button.

"Holdwater"—the command by the coxswain for the crew to drop the blades vertically into the water, straight out and hold them in that position. This is like putting on brakes to slow the boat down.

hook lock—a round retainer which can be rotated by a rod going through the upper and lower guide bearings of the Rottmer releasing gear; the rod in turn is rotated by the red Rottmer releasing lever amidships in the lifeboat. One side of the hook lock has a slot which frees the toe of the releasing hook, but only if the slot exactly lined up by the rods connecting both hooks. This means that both hooks are opened only at the same instant.

hook rings—the heavy metal rings permanently attached to the fall blocks. The purpose of the hook rings are to provide a secure place to attach the Rottmer release hooks when the falls are attached to the lifeboat. When the Rottmer hooks are opened (by turning the Rottmer releasing lever) the hook rings are released from the ends of the boat as the suddenly-opened Rottmer hooks slide out of the hook rings. The hook rings stay on the fall blocks; the hooks stay on the boat.

hull—the outer shell of the lifeboat.

hydraulic pressure cranking system—the starter system for the diesel engine of a lifeboat. It includes an arrangement to handpump two high pressure cylinders to 2500-3000 psi and then release each one by a valve to crank the engine to start it. This system is safer than hand cranking and more reliable than electrical starting.

hydrostatic release—the device which releases the liferaft container from the cradle. May be triggered manually or automatically by 10 to 15 feet of water pressure.

hypothermia—the loss of body heat; anytime your body temperature is below the normal 98.6°F.

inboard—toward the center of the boat or ship

insulator—the ceramic fitting on each of the attenna stays; the purpose of the insulator is to prevent the grounding of the antenna.

international distress signals—signals agreed upon by all maritime nations to use to tell anybody on the seas that you are in distress and need help. Seafarers should recognize at once **all** of the various signals on pages 105 and 106 of the manual.

keel—the heavy rectangular metal bar fastened to the stem and stem post, running the length of the bottom of the boat and supporting the hull.

lanyard—a short line used for fastening or holding something.

leech—the trailing or aft edge of the sail.

leeward—the side of the boat or ship that is sheltered or away from the wind; the calm side; opposite of windward.

left-handed propeller—some diesel powered lifeboat engines are equipped with left-handed propellers, meaning that, when seen from astern, the blades turn in a counter-clockwise direction. See right-handed propeller.

lifelines—lines at least 3/8 inches in diameter of manila or equivalent strength fiber attached along the gunwales of the lifeboat; they must be divided into bights (loops) of 3 feet or less. Lifelines support swimmers or persons who cannot find space in a crowed lifeboat.

life preserver (life jacket)—personal flotation device to keep a person afloat and head up even if unconscious. (See PFD.)

limber holes—openings in the support frame of a lifeboat that let bilge water flow through the different compartments to get to the boat drain.

limit switch—a switch twelve inches from the top of the davit trackway that stops power to the winch automatically when tripped by the davit arms.

locate signal—three SOS groups followed by a thirty second dash transmitted on 8364 kHz radio frequency; this signal should allow radio operators on any ship within radio range to use their radio direction finders (RDFs) to determine the direction from which the emergency signal is coming. When two or more ships compare the direction of the 8364 signals, they can plot the location of the survival craft on a chart and then send help.

locker—a small compartment on a lifeboat; it is used to stow small items of equipment and protect them from the weather.

locking bar—a heavy metal bar across the davit trackway that stops the davit arms from accidentally rolling down the trackway when the gripes are secured.

lubber's line— a line in the window or on the bowl of a compass which is lined up with the centerline of the boat.

luff—the forward or leading edge of the sail.

manropes—lines with spaced figure eight knots that are suspended from the davit span.

markings—letters, numbers or colors used to label or indicate something.

mast—the main upright spar (pole) which holds up the yard and the sail; the mast is held upright by a step, a hasp, a forestay, and two shrouds.

mast hasp—used to support the mast; it is attached to the thwart directly above the mast step.

mast step—where the base of the mast is put for support.

mechanical davits—the second major type of davits for lifeboats. Three common mechanical davits are the quadrantal, the sheath screw boom, and the sheath screw crescent. Mechanical davit arms must be hand-cranked out over the ship's side by screws, gears or other mechanical means. Unlike gravity davits which only require energy to swing them back aboard, mechanical davits require energy **both** to crank overboard **and** to crank back aboard to the stowed position. Mechanical davits require a well-trained crew to safely launch a lifeboat.

Miranda (MIR) gravity davit—the newest one of the three common kinds of gravity davits. It is used to launch enclosed lifeboats. See gravity davits.

mooring—securing the boat or ship to a dock, another ship or the shore.

muster list—a list given to each lifeboat's coxswain. It contains the rating and abandon ship duties of each crewperson assigned to that lifeboat.

nested boats—lifeboats stowed in the same davit, one boat under the other.

November Charlie—internationally recognized signal flags for distress.

"Oars"—the command by the coxswain for the rowers to stop rowing and bring the blades out of the water and hold the oars straight out blades feathered flat. This is the neutral position.

"Oars out"—the command by the coxswain to have the rowers prepare the oars to begin rowing. Upon hearing "oars out!" the crew puts the lifelines out, the rowlocks in sockets, places the oars in the rowlocks with the blades feathered flat, and then awaits the next command.

outboard—towards the outer edge of the boat.

painter—a manila rope at least two and three-quarter inches in circumference used for tying or mooring. May also serve as a sea painter.

painter-operating cord—a 100 feet line which: (1) triggers the automatic inflation system of a liferaft when the vessel has sunk 100 feet below the surface, and (2) becomes the sea painter when the liferaft is launched manually.

patch (sealing clamps)—used for plugging large holes or holes in wet areas on a liferaft.

PFD (Personal Floatation Device)—the official term for life jackets or life preservers.

petcock—the valve on the sea anchor which controls the flow of storm oil.

pintles—metal pins on the rudder; pintles are placed into gudgeons on the sternpost when using the rudder. See gudgeons.

plating—the metal siding of the lifeboat.

port—the left hand side of the boat or ship when facing the bow.

port tack—sailing with the wind coming over the port bow.

portable radio—the small battery or hand-generator operated radio transmitter designed to be kept on the vessel's bridge and carried into one of the lifeboats; there it can be rigged to send signals automatically or manually on two marine distress frequencies: 500kHz and 8364 kHz.

post—to put up or list.

pressure relief valve—valves which allow excess CO_2 gas to escape from the buoyancy tubes after the liferaft is fully flated.

preventer bars—small, gravity loaded bars on each side of each Rottmer releasing hook. The purpose of the preventer bars is to allow the fall block's hook ring to snap easily into the closed Rottmer hook, but prevent it from accidentally falling out of the hook until the releasing hooks are opened. The preventer bars keep one end of a lifeboat from coming out of the falls while the other end is still attached to the ship. If this were to happen in heavy seas, the lifeboat could be turned suddenly on its end, with dangerous results.

protective cover (canopy)—the cover is spread over portable frames set in sockets along each side of the lifeboat. It shelters the lifeboat occupants from the weather, its bright color makes the boat more visible to search planes. It is not the same as the storage cover spread over the boat when it is in the davits on the ship.

provisions—the food provided for each person on a lifeboat or liferaft.

pulling boat—a boat powered by rowers.

pyrotechnics—the category of signaling devices which includes (1) hand-held red flares, (2) red rocket parachute signals, (3) floating orange smoke signals, and (4) combination hand-held flares and smoke signals. All the pyrotechnics are approved for only three years from the date of manufacture.

quadrantal davit—one of the three common kinds of mechanical davits. Turning a crank handle rotates a worm gear along which a travelling nut attached to the boom moves. Thus, the travelling nut moves the davit arm outboard or inboard, depending on which way the crank is turned. Quadrantal davits will have wire falls if they are provided with a winch but will have manila or fiber falls if they do not have a winch. See mechanical davits.

quarter—the aft part of the boat's side; also the direction at a 45° angle aft of the beam.

radial davits—the oldest of the three major types of davits for lifeboats. The heads of the davit arms on radia davits are swung out in horizontal arcs to lower or raise the boats. Radial davits are allowed only on small vessels. They traditionally have no winches; therefore, they must use manila or fiber falls which are paid out by hand over cruciform bitts or cleats.

radio direction finder (RDF)—a rotating antenna device aboard all ships and rescue aircraft which can determine the direction from which an emergency radio signal is being sent. Comparing this signal from two or more different RDFs allows the rescuers to plot the location of survival craft on a map.

reach—the position that a sailing boat is in when the wind is blowing broadly from either side. If the wind is blowing over the starboard gunwale, you are on a starboard reach. If the wind is blowing over the port gunwale, you are on a port reach. Sailing on a 90° reach in an open lifeboat in heavy seas is not practical because the boat is in the broach position and might easily capsize.

reef points—small lanyards attached to the sail; used to make the sail smaller in strong winds.

releasing hooks (Rottmer releasing hooks)—the large metal hooks at each end of the lifeboat which can be locked closed in the down position, but which instantly open when the lever in the boat is turned. The purpose of the releasing gear is to free both ends of the lifeboat from the falls at the same time. The hooks close on the fall block rings and support the whole weight of the lifeboat when it is being raised and lowered in the davits.

releasing lever (Rottmer releasing lever)—this is the control lever which opens the hooks from which the lifeboat hangs on the davits. Turning the releasing lever releases both ends of the lifeboat at the same instant no matter how high above the water the boat is. Therefore, the lever must be painted a bright red against a 12 inch white background and it must have the words, **"DANGER: LEVER DROPS BOAT"** clearly printed on the lever.

rescue vessel—any ship or plane used to rescue people who have abandoned ship.

right-handed propeller—most lifeboats are equipped with right-handed propellers, meaning that, when seen from astern, the blades turn in a clockwise direction. Knowing this is helpful because the right-handed propeller will tend to thrust the stern to starboard when the boat is moving forward in the water, but it will tend to thrust the stern to port when the motor is in reverse and the boat is backing astern.

righting strap—the strap fitted under the liferaft; used to turn a capsized raft right side up.

roller gravity davit—one of the three common kinds of gravity davits. It is the most common kind of davit aboard today's merchant marine vessels. (See gravity davits.)

Rottmer releasing gear—the system which releases both ends of the lifeboat at the same time.

rowlocks—U-shaped, metal brackets located on the gunwale used to hold the oars.

rudder—a movable, flat piece of wood or metal placed at the stern used to steer the boat.

running free—sailing with the wind coming from abaft the stern.

safety pin—the small metal locking pin which secures the Rottmer releasing lever from being accidentally thrown, thus unexpectedly opening the hooks and dropping the boat. Notice that when you are returning to a vessel preparing to hoist the lifeboat back aboard, you must lock the releasing hooks before you snap the hook rings in place past the preventer bars. However, it is important that you **not** replace the safety pin until you are certain that **both** fall blocks are secured in the hooks. If the winch begins operating with only one block attached, you would need to quickly turn the releasing lever.

sea anchor—see **drogue.**

sealing clamps—oval shaped plates held together by a thumbscrew tightening wing nut on a long break-away screw. Six sealing clamps of assorted sizes are provided for each liferaft to repair holes which are too large (or cannot be kept sufficiently dry) to be repaired by the rubber tube patches.

sea painter—see **painter.**

seaworthy—a vessel that is fit to sail.

sheath screw davits—two of the three common kinds of mechanical davits. Turning a crank handle either extends or retracts a long screw into or out of a long threaded sheath. This either moves the davit arm over the side of the vessel or pulls it back inboard. Sheath screw davits will have wire falls if they are provided with a winch, but will have manila or fiber falls if they do not have a winch. (See mechanical davits.)

sheave—grooved wheels in a block over which wire or rope passes; pulley wheels.

sheering—when a boat or ship swerves from its set course.

sheer strake—the first row of plating just below the gunwale.

sheet—a manila or fiber line attached to the clew (lower aft corner) of the sail; the sheet is the control line used by the helmsman at the tiller to adjust the angle of the sail to the wind when sailing; if a sudden gust of wind hits the sail you can release the sheet to keep the boat from being blown over.

sheets—the seating areas at both ends of a lifeboat; the stern sheets and the bow sheets.

shrouds—two galvanized wire ropes of not less than 3/16 inches diameter which run from the top of the mast to each gunwale; the shrouds support the mast.

sidebenches—extra seating along the sides of the boat.

silent periods—15 to 18 minutes after each hour and 45 to 48 minutes after each hour; these three minute periods are reserved for distress radio signals from survival crafts. Ship radio operators may not transmit routine messages during these silent periods; they are supposed to tune their receivers to the 500 kHz frequency and listen. If you are sending emergency signals from a lifeboat portable radio, keep transmitting especially during the silent periods.

single pivot gravity davit—one of the three common kinds of gravity davits. (See gravity davits.)

stabilize—to make a lifeboat or liferaft resistant to capsizing.

stanchion—upright braces under each thwart to support it and to provide extra strength to the boat.

standing lug rig—the type of sailing equipment provided on all oar propelled lifeboats.

starboard—the right hand side of the boat on ship when facing the bow.

starboard tack—sailing with the wind coming over the starboard bow.

static electricity—the quantity of electrical energy within a substance or upon its surface waiting to be suddenly discharged upon grounding. The rotating blades of a rescue helicopter build up large quantities of static electricity which the pilot must discharge by touching the hoist cable into the water or upon the deck before you can safely touch the basket or cable.

station bill—a list of alarm signals, instructions, and emergency duties posted where all crew members can find it.

steering oar (sweep oar)—the longest oar used to steer the lifeboat if the rudder is damaged or missing.

stem—a heavy rectangular metal bar located at the bow and running from gunwale to keel.

stern—the rear area of the boat.

stern gland—a stuffing box which contains packing to prevent water from entering the lifeboat through the stern tube.

stern post—a heavy rectangular metal bar located at the stern and running from gunwale to keel.

stern sheets—the aftermost seating area in the boat.

stops—the mechanical blocks at the top of the roller inside trackway of the roller gravity davit. Because the limit switches (if they are working right) prevent the electrical winch from pulling the davit arms within twelve inches of the stops, the winch operator must turn off the emergency disconnect switch and hand-crank the winch the last twelve inches from the limit switches to the stops.

storm oil—the animal, fish or vegetable oil used in a sea anchor to help stop the waves from breaking; this helps the crew stay drier.

stretchers—used by the rowers to brace their feet. See footrests.

supplementary station bill card—a small card that lists your individual emergency duties; usually posted near your bunk or handed to you when you board ship.

survival craft—any lifeboat or liferaft used to abandon ship.

sweep oar—see **steering oar.**

swell—a wave.

tack—in sailing, this term has four distinct meanings: 1. (noun) The tack is the lower forward corner of the sail; it is sewed with extra canvas to re-enforce it and it has a large grommet or metal eyelet through which the downhaul line can be tied to hold the sail in place when it is hoisted. 2. (verb) To tack is to sail within 45° of the direction from which the wind is coming. 3. (noun) The position that the boat is in when it is beating into the wind. If the wind is coming over the starboard bow, you are on a starboard tack. If the wind is coming over the port bow, you are on a port tack. 4. (verb) To tack also means to change from a starboard tack to a port tack and vice versa.

thwarts—places for rowers to sit; the thwarts also provide athwartship strength to the lifeboat.

tie down straps—the straps which hold the liferaft container in its cradle on the vessel's open deck; the tie down straps are released by the hydrostaticrelease.

tiller—the bar or handle used to turn the rudder.

toggle pin—a metal pin which connects the tiller to the rudder.

toggle pin and eye splice—the loop (eye) at the end of the sea painter that is attached to the forward thwart with a hardwood spike (toggle pin).

"Toss oars"—the command by the coxwain for the rowers to raise their oars smartly to the vertical, hold the handles on the bottom boards with the blades feathered fore and aft. This is used as a salute to somebody outside the craft.

towing bridle—used to tow or hoist the liferaft aboard a ship; usually combined with the **boarding ladder.**

"Trail oars"—the command by the coxwain for the crew to move the oars in close to the side of the boat to allow the boat to pass close to an obstruction without hitting the oars.

tread and scull—a way of moving your arms and legs in the water that allows you to stay afloat and look around or call for help.

tricing pendants—the lines which automatically pull the lifeboat into the embarkation deck as it is lowered in gravity davits.

tube patch—used to repair small holes in dry areas of the liferaft.

turnbuckle—used to adjust the gripes.

unicellular plastic foam—a type of buoyancy unit used to stabilize the lifeboat and keep it afloat even if it is full of water.

ventilators—openings in enclosed lifeboats which allow fresh air to enter; they may be manually closed in smoke or dangerous fumes.

water pockets—see **ballast bags.**

"Way enough"—swing oars into the boat with the blades forward. Take rowlocks out of sockets. Bring lifelines in.

weak link—the part of the liferaft painter-operating cord which is attached to a shackle on the cradle. It is strong enough to trip the CO_2 inflation system but too weak to pull the raft down with the sinking ship.

Williamson Turn—a type of turn which allows a vessel to retrace its previous course; used when a person falls overboard and is lost from view.

winch—a motor powered device which uses wire cables to raise and lower a lifeboat.

winch raise button (hoist button)—a switch on the winch electrical control panel. It operates like a doorbell switch; holding it in makes an electrical circuit which operates the motor of the winch and winds the falls on the drum of the winch. To stop raising the falls, release the spring-loaded button and the electrical circuit is broken stopping the motor.

winch remote control wire—this allows the crew of an enclosed lifeboat to board the boat in its cradle at the stowed position, close the hatches and rowing ports, turn on the compressed air supply, and lower the lifeboat to the water from the comparative safety of inside the closed lifeboat. The winch control wire allows the winch operator to release the brakes on the winch without standing exposed to fumes and fire on the open deck.

windchill—the combined effect of air temperature and wind speed upon body temperature. Moderately low air temperatures can be very dangerous to exposed body surfaces in the presence of moderately fast winds. For example, an air temperature of 20°F in a 25mph wind can freeze body flesh at the same rate as -15°F in no wind.

windward—the side of the boat or ship toward or facing into the wind; the side of the ship from which the wind blows opposite of leeward.

yard—the long, slender spar (pole) used to support the top edge of the sail; the yard is attached to and hoisted by the halyard, which runs through a sheave at the top of the mast.